THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2153.] LONDON, AUGUST 16, 1904. [56TH YEAR. PRICE 6d.

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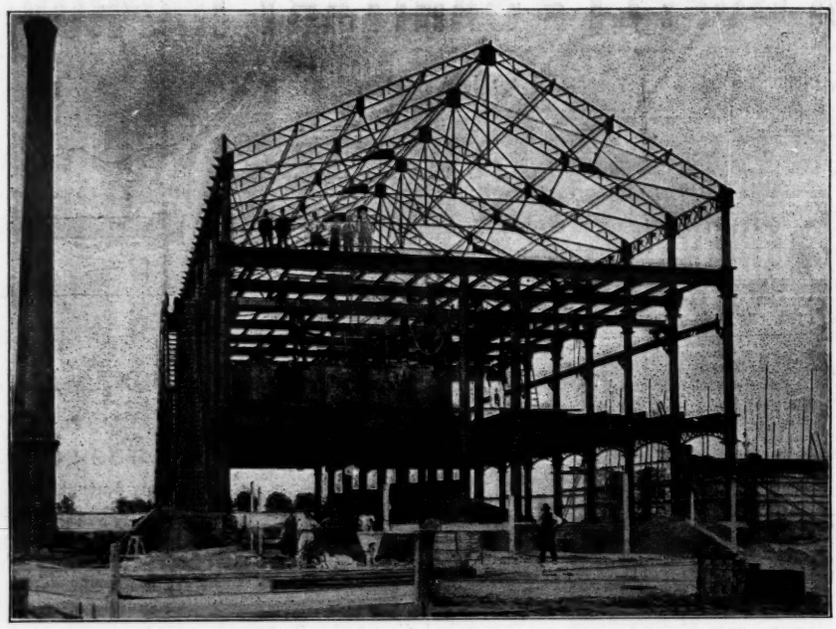

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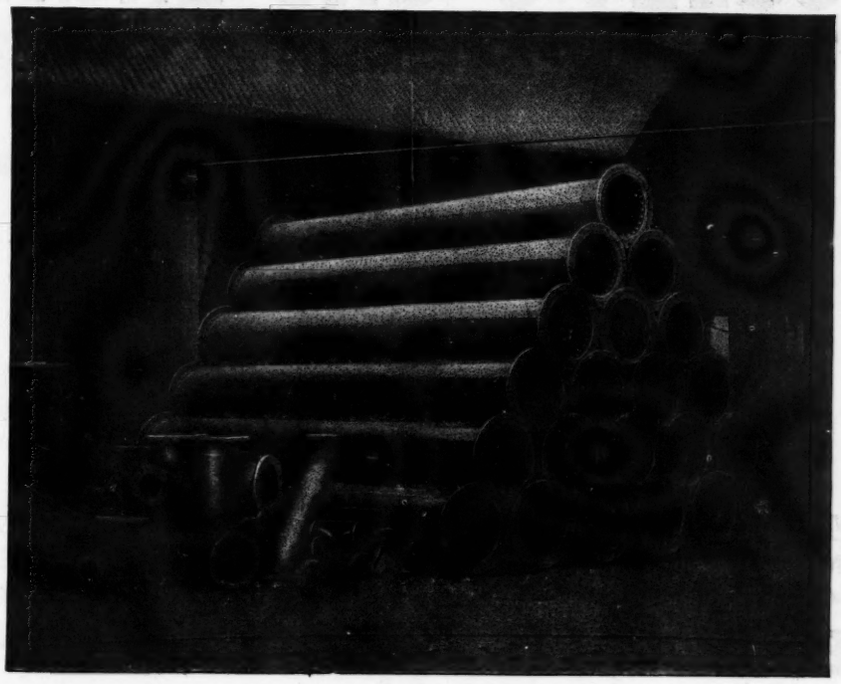

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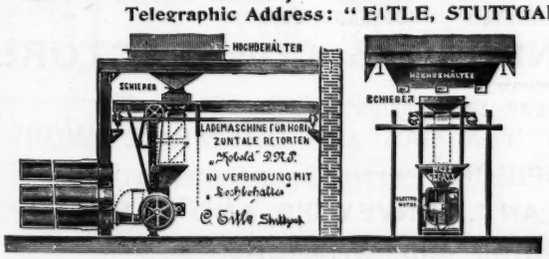

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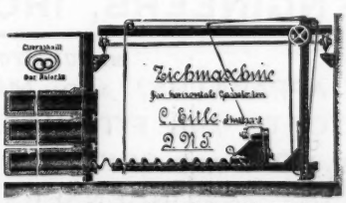

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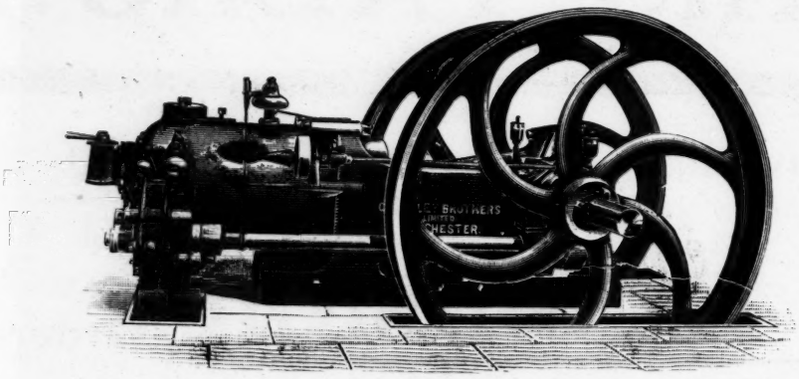

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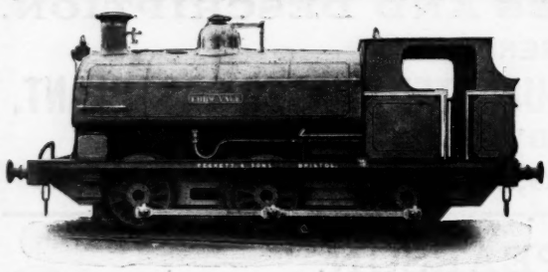

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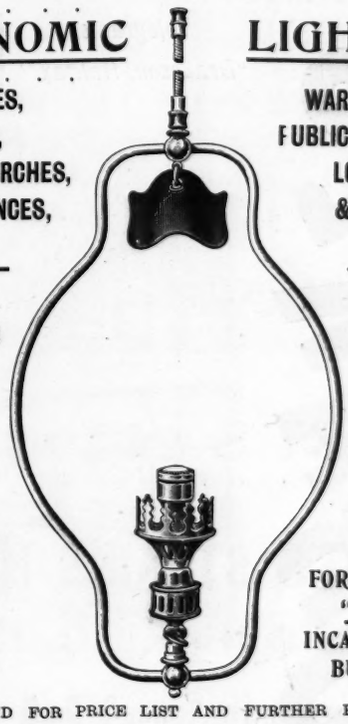

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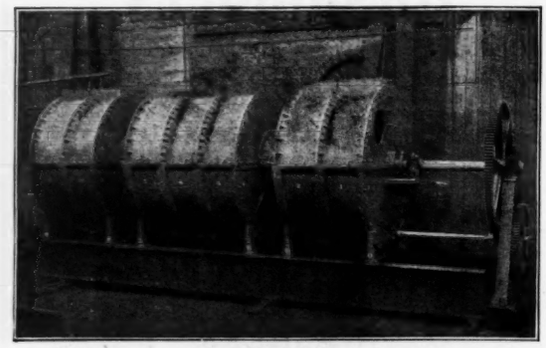

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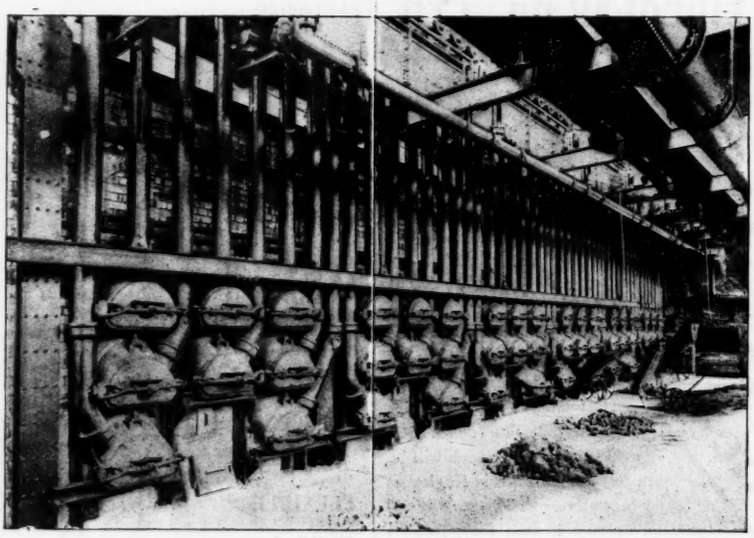

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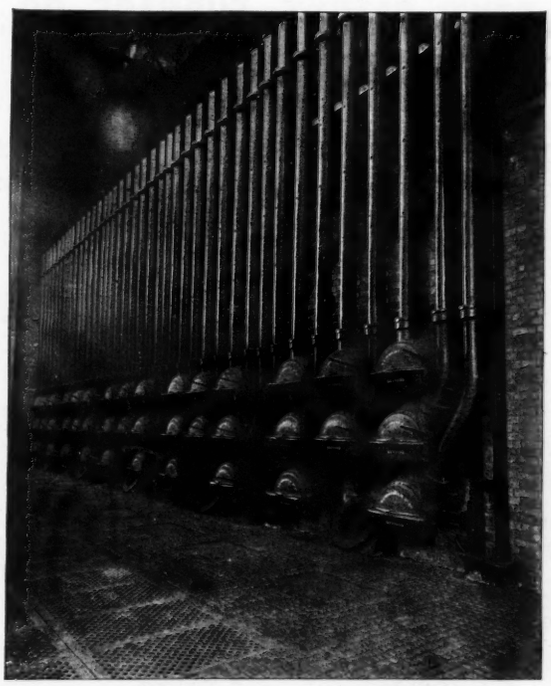

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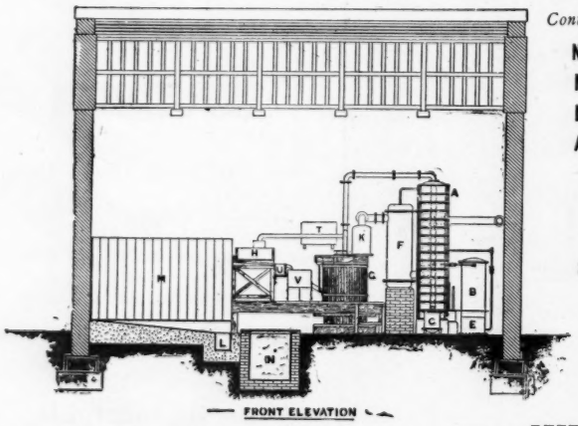

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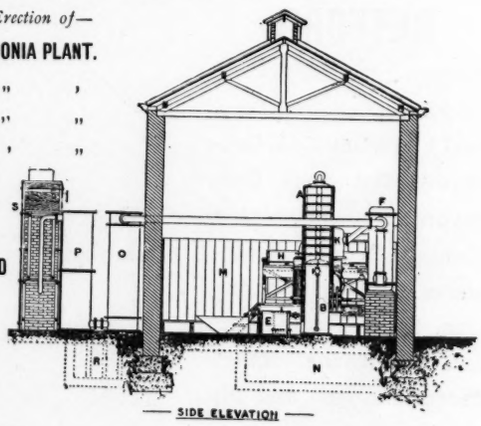

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G. Saturator.
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M. Sulphate Store.
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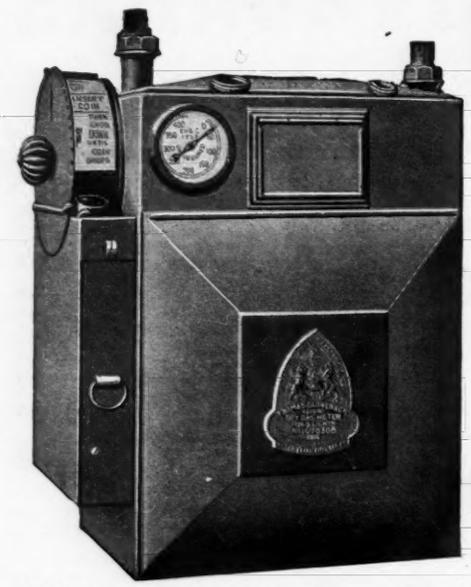

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXVII., No. 2153.—TUESDAY, AUGUST 16, 1904.

EDITORIAL NOTES—GAS, &c.

The South Metropolitan Meeting.

MORE EPOCH-MAKING! Last week we reported the unwonted but gratifying spectacle of the three Metropolitan Gas Companies in unison; and now comes a declaration from Sir George Livesey of hostility to all penal restrictions as to quality of gas supply—the sliding-scale being, in his opinion, ample protection for the consumer. This important pronouncement was made at the South Metropolitan Gas Company's meeting last Wednesday, when the Great Hall at Cannon Street Hotel was almost filled with shareholders who gave Sir George a very cordial welcome on his taking the chair. Without any preliminary sentences or trotting out of figures from the statement of accounts, the Chairman led his audience straight to that which he described as the most important matter in the report—namely, the recommendations of the Departmental Committee of the Board of Trade as to gas-testing in the Metropolis. These he described—speaking, as he said, to the gas industry through the shareholders—as a step towards freedom from the tyrannical and vexatious restrictions which had been laid on the gas industry; freedom to do the best they could for the consumers.

This was the first note of his speech; it was also the last. He explained the extreme severity of the test prescribed by the Gas Referees in pursuance of the statutory requirement that the gas shall be wholly free from sulphuretted hydrogen, and according to which the presence of a ten-millionth part of this gas might subject the Companies to forfeiture. He described the steps taken to ascertain what actually is the effect upon the atmosphere of a room, of the combustion of gas containing those compounds of sulphur which, ever since the days of Dr. Letheby (nearly forty years ago), the Companies have been compelled to remove within defined limits. He told how this investigation resulted—as has already been reported in the "JOURNAL"—to the surprise of every one, and the discomfiture of the "men of science divorced from "industry," in the discovery that the sulphur-acids do not remain in the atmosphere, but are absorbed by the lime and white wash of the walls and ceiling, or are collected in the moisture which condenses. The credit of having initiated the examination which led to this discovery is entirely due to the South Metropolitan Company, at the instance of their Chairman, who modestly refrained from referring to his part in the matter. Having mentioned that no recommendation has been made by the Committee as to illuminating power, the Chairman observed that there had been some talk of a test being imposed for calorific value. This he declared to be wholly unnecessary, since the Companies, in their own interests, will take care to supply their customers with what they require.

In this connection, Sir George took exception to the article which appeared in last week's "JOURNAL" on "The "Testing Committee and a Calorific Power Test." The objects of this article were threefold—in the first place, to epitomize the evidence laid before the Committee on the subject; secondly, to call attention to the signs (the "hand-"writing on the wall") that have been seen in the parliamentary committee-rooms, and now in the recommendations of the Board of Trade Committee, of an attempt being made to impose a calorific test; and, thirdly, to impress upon the gas industry that such a test must be resisted with might and main until (if Parliament insists) it is conclusively shown what it is that the consumers need in this respect, having regard to price, and until it is proved definitely what are the conditions and requirements which should form, if imposed, the foundation of the test. Gas is still shackled to an illuminating power test; and if the Committee's recommendation in this respect prevails, it will be of a more doubtful character than ever. But if the article in question be read carefully, it will be seen that its tone (if words do not express it) is clear as to our antagonism to a calorific power test being inflicted while that for illuminating power remains. The "handwriting on the wall" is an effect of the true argument that gas is every day being applied more and more abundantly for heating and incandescent lighting than for its direct luminosity. The handwriting has been put on the wall by those who see that the old test is already slipping from their grasp; and they seek to be prepared with a new one to replace the old, although they will try to retain that also. To Belshazzar, Daniel interpreted "Tekel" to mean "Thou "art weighed in the balances, and art found wanting." That is not the "handwriting on the wall" for the gas industry at the moment. It is that "A Calorific Test shall be "required of thee," in view of the extending use of gas for heating purposes. Pointing to this handwriting is not to say that we are in favour of such a test. We are, as we ever have been, distinctly unfavourable to, and our efforts will continue to be directed against, any unnecessary restrictions; and if our inference as to the imminence of such a test be not borne out by the result, we shall rejoice. But there is the handwriting; and Sir George cannot, and no one in the industry can, afford to ignore it. All, however, can do their part in offering resistance to the threatened new fetter. Still, whether in anticipation of a test being imposed or not, the evidence clearly points to the desirability, in the interests of gas undertakings, of further information on the subject of calorific value; and our having called attention to this may, it is hoped, count as one of the services—slight though it be—which it has always been our endeavour to render to the industry, and to which Sir George Livesey very kindly referred.

The competition of gas with electricity, oil, or (and into which it enters as a heating agent) with fuel of all kinds—including varieties of producer gas—was strongly urged by the Chairman as a reason for granting Gas Companies the freedom which he advocates. Electricity undertakings, however, although apparently unduly favoured just now by the Legislature, have restrictions laid upon them; while the distributors of "power" gas are under obligations as to calorific value and proportion of carbonic oxide. The greatest hit of the Chairman was, however, his reference to non-statutory undertakings. He has been satisfactorily supplied for the last ten years by one of these—the Company not being under any restrictions as to price, or illuminating power, or purity. There are many similar Companies throughout the length and breadth of the land, who have supplied gas for very many years with complete satisfaction to their customers, for aught that is known to the contrary. The wonder is, why such Companies ever trouble Parliament; but that, it may be said, "is another story."

The Chairman, referring to the excellent results of the half-year's working, attributed them to the good services rendered by the chief officers, subordinates, and workmen, which fully justified the large sum paid to them as co-partnership bonus; and he concluded by again urging the necessity for more freedom. "Freedom from all penal restric-"tions must be our aim henceforth," is now his message to the gas industry. The report was adopted without remark from the shareholders; but Mr. George Howlett found an opportunity, in seconding one of the customary votes of thanks, for some well-chosen words appreciative of the great services rendered, not only by the Chairman and Directors, but by all the officers and employees. It was a record-breaking time, he said, since the shareholders would be receiving the highest dividend ever paid, while the price of gas was now the lowest it had ever reached in London. To this, Mr. Charles Carpenter was able to add that the yield of gas per ton of coal used was now the highest ever recorded. Mr. Frank Bush is usually able, at these half-yearly gatherings, to supply some interesting piece of information about the accounts; and very noteworthy was his mention this time of the fact that the 116 slot-meter collectors—receiving between them about £6000 every half year—were all of them men who had been promoted from subordinate positions in the Company's service, and now held between them stock in the Company amounting to an average of £45 apiece.

The South Suburban Gas Company.

THIS Company's meeting on Friday—following closely upon that of the South Metropolitan Company—gave Sir George Livesey an opportunity of returning to the subject of penalty testing. This he holds to be unfair to the gas industry, inasmuch as it is not applied to electricity or water supply, though there is as regards the latter special danger to health and life in the supply of impure water. To both these supplies, the same conditions apply as to gas—in the breaking up of streets and roads. Why, therefore, should gas undertakers be singled out in such a manner as to give the public the impression that they are rogues who must be looked after! Prior to 1860, there was no gas testing; and no one was the worse for it. Freedom is now for the first time in sight, and care must be taken that there shall not henceforth be any penalty testing but such as honest men can comply with, without difficulty or anxiety. The utter absurdity of the situation for the last thirty or forty years, as respects purification from sulphur, is that people on the lookout for this impurity searched everywhere for it but in the direction in which its existence might be some inconvenience to the consumers. They tested everything—scrapings from brass work, deposits on leather, condensation—everything but the air of the room in which the gas is consumed. And now when at last the latter is tested, the sulphur impurities cannot be found! What a satire is this on Science assisting Industry! It is under the influence of this delusion that the gas companies and their consumers have all these years been put to enormous expense, and compelled to continue a system of purification which is found by the Board of Trade Committee to be an annoyance to the neighbourhood of gas-works, and has a "deleterious effect on the workmen "employed in connection with the process."

Continuing, the Chairman observed, as regards the suggested test for calorific value, that the gas industry must not submit to it, since no one can at present tell what is the best and cheapest heating gas that can be produced. We agree with him entirely in deprecating the imposition of any such test—at all events at the present time, when gas supply is passing under new conditions which are not yet clearly understood. The Companies require, and ought to have, that freedom and latitude which Sir John Brunner, when presiding over the Committee on the Crystal Palace Gas Bill last year, declared was necessary; and certainly it would be fatal to progress if, when striking off the old fetters, new ones were imposed—possibly more onerous, because under present circumstances a mistake may be very easily made. Give the companies this necessary freedom, and they will soon find out how best they can serve their customers.

The Chairman briefly referred to the provisions of the Company's new Act, which he described as having been emasculated in consequence of the then pending report of the Board of Trade Committee. As regards the action of the Directors thereupon, as notified by the circular to the consumers (a copy of which was published in our issue of July 12), it appears that only a few letters have been received in response, from consumers—nearly all of them being favourable to the change. One of these hopes the Local Authorities will not be so stupid as to object; while another is of opinion that the Directors have "solved the "problem satisfactorily by choosing the lesser of the two "evils." Another, however, thinks the gas "atrocious, as "it always has been," and that it cannot be made worse; while yet another considers the course taken by the Directors to be "full of danger." Of the latter, the Chairman's observation, that if this view were always to prevail, there would be little progress in the world, was to the point. Users of carburetted water gas who have expressed objection to the circular were reminded that this is a free country, where everybody has a right to his own opinion. We may have occasion to refer to the subject later.

It appears that the Company contemplate another application to Parliament next session, which, however, will not be persevered in if met by factious opposition. The Board are prepared, however, to meet the Local Authorities in every way possible; and it is greatly to be hoped that this disposition will be correspondingly met, in which case an amicable arrangement should result. The scheme for the election of Employee Directors was unanimously approved of by the shareholders at the extraordinary meeting which followed. The Chairman, however, mentioned that there might be some delay in putting the scheme into operation owing to the small number of employees at present qualified. The fact, however, that the scheme is now "in being" should be an additional incentive to all the employees to increase their holdings of the Company's stock to the required amount.

The Report and Accounts of the Commercial Gas Company.

THE report which the Directors of the Commercial Gas Company will present to the shareholders at their half-yearly meeting on Thursday next is characterized by the brevity which is customary in these documents. What is stated therein is, however, highly satisfactory; and therefore the Chairman, Mr. W. Graham Bradshaw, will have a pleasant task before him when he rises to address the proprietors upon the results of the Company's operations, and doubtless upon the position of the undertaking in its relation to the other Metropolitan Gas Companies. For recent events furnish unmistakable evidence of a tendency to a concentration of forces in a movement which may have far-reaching effects upon the gas industry. Confining ourselves, for the moment, to the affairs of the smallest of the three Companies, we find that the revenue in the first half of the present year amounted to £242,457, of which £177,282 was derived from the sale of gas. In the preceding six months the figures were £244,797 and £177,232; while in the corresponding half of 1903 they were £244,170 and £171,434. In the first six months of last year, the meter and stove rentals produced £11,108; and the development of the Company's business is shown by the fact that by the close of the year the amount had risen to £13,335, while in the period which has since elapsed another £521 has been added, making it £13,856. On the manufacture of gas, £136,392 was spent in the six months just passed, compared with £140,007 and £140,173 in the two immediately preceding similar periods; the coal and oil bill showing a gradual reduction from £86,888 to £84,535 and £82,586. The Company's total expenditure has not fluctuated very greatly in the periods under review, seeing that it amounted to £177,837 in the first half of 1903, while in the two succeeding half years it has been £182,113 and £182,022. It is unnecessary to refer in detail to the accounts, as the principal items will be dealt with by Mr. Bradshaw in the entertaining manner with which the proprietors are now familiar. Suffice it to say that the amount available for distribution is £73,866, against £64,855 this time last year and £70,997 six months ago. The shareholders will receive dividends at the accustomed rates; the consumers, as already announced, will have their gas 1d. per 1000 feet cheaper; and the item of £2454 entered in the revenue account for profit-sharing shows that those whose labour has contributed much to the realization of these advantages have not been left out of consideration. More capital is wanted to meet the Company's requirements; and the proprietors will be asked on Thursday to sanction the raising of it.

Gas Business in the Suburbs and Provinces.

OUR readers will not fail to notice that a large portion of the present issue of the "JOURNAL" is devoted to proceedings at meetings of gas companies, or to preliminary summaries of the reports and accounts of others shortly to be held. It is inevitable that it should be so just after the turn of each half year. But we think they will agree with us that the records there presented furnish abundant proof that the prognostications of the partisans of the electric light a quarter of a century ago, that in a few years the gas industry would be in a moribund condition, are very far from having been verified. The positions of the second largest of the Metropolitan Companies and some of the Suburban Companies are dealt with elsewhere; among the latter being the West Ham, who have decided to give more publicity to their affairs than hitherto by making the meeting an open one. Attention may, however, be directed here to the Directors' report of another—the Croydon—which will come before the shareholders for adoption next Friday. The characteristic feature of the past half-year's work of the other Companies is also to be found here; the sales of gas showing an increase of 9·45 per cent., as compared with those for the corresponding period of 1903. The result of the good

working is that the amount available for dividend is about £5000 more than it was this time last year. The Directors are making a bid for additional business by reducing by 3d. per 1000 cubic feet the price of gas used for the purpose of motive power, and also by allowing discounts to large consumers of from 2½ to 5 per cent., according to their annual consumption. The Company have just obtained further parliamentary powers under which the consumers in the Carshalton portion of the district get the benefit of a reduction of 3d. per 1000 cubic feet as from June, with the prospect of a further concession in the not distant future.

Turning to the Provinces, the Sheffield Company had an increase to the extent of close upon 20 million cubic feet, or 1·49 per cent., in the first half of the year, compared with the corresponding half of 1903. But as in the course of that time the price of gas was lowered by 6d. per 1000 cubic feet, the revenue necessarily fell off. Nevertheless the full amount required for the dividend was earned, with a balance of £2170 to the good. At Bristol, things were even better, for the balance, after providing for the dividend, was £10,428. But there had been no concessions to the consumers as in the case of the Yorkshire town. They have, however, since been considered to the extent of 1d. per 1000 cubic feet for ordinary, and 4d. per 1000 cubic feet for large consumers. When the Company get into the capacious new offices they are erecting, adjoining the Colston Hall, they will, among other things, show people who wish to employ electricity for lighting their premises how to utilize gas to generate it. This will be a new departure, and it may possibly lead to the conclusion of a contract similar to that in existence at Malton, where the local Electricity Company depend upon the Gas Company for their power. At Tunbridge Wells there was an increase of 7¾ million cubic feet, or 6½ per cent., in the quantity of gas sold in the past half year, though the general trade of the town was anything but good. This is accounted for by the fact that the Company have afforded great facilities for the use of gas for culinary purposes in small households. In the two cathedral cities which figure in our list—York and Chester—good business has been done; and in the latter case the employees participate in the profit to a substantial extent. On the whole, all the Companies referred to are justified in looking for continued, and even increased, prosperity in the half year upon which they have entered.

Gas Threatened by a Wonderful New Fuel.

According to a paragraph which is going the round of the papers, gas will shortly be attacked in one of its strongholds by a new fuel which is reported to possess wonderful heating properties. It is the invention of two young engineers—said to be connected with "one of the largest firms of gas engineers in the country"—who have given their joint production the name of "Radiant." It is the result of years of experiment, and the following advantages are claimed for it: "(1) That it gives treble the heat with the same gas consumption as an ordinary gas-fire. (2) That it takes up the carbonic oxide from the air, and purifies the atmosphere. (3) That it does away with the unpleasant smell given off by gas-fires. (4) That it burns brightly like a coal fire. (5) That it is as cheap as fire-clay, and is inexhaustible." Radiant is to take the place of the asbestos or fire-clay balls, and will, it is asserted, give out an intense heat. It is made from materials that are now the waste products of chemical works. Shortly, the new fuel captures the blue flame which at present is lost, and converts it into intense heat. It is also said to possess the power of retaining heat to a very great extent. Gas makers, coal merchants, and other suppliers of fuel, must now look to their businesses. Since the above was in type, we have received from the patentees a sample of Radiant; and we may have something to say in regard to the capabilities of the material by the time the next number of the "JOURNAL" goes to press.

Statistics of the Gas Industry in Holland.

It may be remembered that in the course of the report of the proceedings at the recent annual meeting of the Dutch Association of Gas Managers which appeared in the "JOURNAL" for the 19th ult., it was mentioned that a very interesting communication was made by the Secretary, Heer N. W. van Doesburgh, of Leyden, on the progress and present state of the gas industry in Holland, and that the author had promised to afford us facilities for its publication in our columns. He has fulfilled his promise by sending a translation of his paper; and we have pleasure in giving it elsewhere. The statistics presented embody the results of the working of 83 undertakings, furnishing gas to 2,382,000 persons—about 45 per cent. of the entire population of Holland. The figures are grouped under five heads—the first of them comprising gas-works in towns containing more than 100,000 people, and the rest taking in smaller towns and villages. It will be seen that the bulk of the raw material used (67·4 per cent.) is Westphalian coal; the rest being English; the quantity carbonized in the year 1902—the one to which the statistics relate—being 721,546 tons, which produced 7,423,739,000 cubic feet of gas. The tables compiled by the author show the production of gas and residuals per ton of coal carbonized, the proportion of gas used for different purposes, the consumption per inhabitant and per yard of main, the number of ordinary and slot meters in use, the quantity of gas passed through them, and other particulars. He acknowledges that they are the fruits of the labours of Heeren van der Horst and Bolsius, who for some years have collated these statistics. To them primarily he was indebted for the material for his instructive paper. But the thanks of English gas managers are due to him for presenting them in what may be called the vernacular. No one who has not had to do much technical translation can appreciate the extent of the labour involved in converting the metric into the Imperial system of weights and measures. This Heer van Doesburgh has taken the trouble to do; and this is an additional reason for commending his paper to the attention of our readers.

High Rates

At the Plymouth Fishing Feast some weeks ago (as mentioned in the "JOURNAL" at the time), the Town Clerk of the borough entered into calculations, based upon the cheapness of gas and water, as to the economy of living in Plymouth in comparison with other towns. The rates, he admitted, are high; but the ratepayers who grumble over the advance of 1s. 6d. or 2s. in the pound on the sum they paid ten or a dozen years ago were invited to console themselves with the reflection that they are supplied with water and gas at lower prices than the inhabitants of most other towns. Setting off the one thing against the other, the people of Plymouth were asked to believe themselves really very fortunate, and not at all ill-used by those who kept adding to the municipal burden. Statistics have now been published in support of this contention, and they will be found elsewhere. The towns selected for comparison with Plymouth are Brighton, Hastings, Portsmouth, Southampton, Torquay, and Devonport. The lowest rated of these is Portsmouth, where the rates are 6s. 8d. in the pound. In Torquay the total is 7s.; in Devonport, 7s. 1d.; in Hastings, 7s. 2d.; in Plymouth, 7s. 5d.; in Brighton, 7s. 8d.; and in Southampton, 9s. 7d. With regard to gas, the prices are: In Plymouth, 1s. 9d. per 1000 cubic feet; in Portsmouth, 2s. 4d.; in Devonport, 2s. 6d.; in Southampton, 2s. 9d.; in Brighton, 2s. 11d.; in Hastings and Torquay, 3s. Charges for water cannot in all cases be so exactly stated. In Brighton the water-rental is 9d. in the pound; in Southampton it is 11d.; in Torquay, 1s.; and in Hastings, 1s. 4d. In the other towns the charge is levied upon a scale which varies in accordance with the rental of the houses.

And Cheap Gas.

In order to arrive at a basis for comparison, the Town Clerk took counsel with Mr. J. A. Bellamy, the Chairman of the Plymouth Gas Company, and obtained statistics as to the average gas consumption of houses of varying rentals in Plymouth. It is assumed that this consumption is a fair criterion of that of houses of like class in other towns. The net result of the calculation is to show that for householders who are also gas consumers Plymouth is not so dear a place to live in as its high rates would suggest. On the basis of the rates and water-rental alone, Torquay is the cheapest of the seven towns included in the comparison; Portsmouth coming next, then Plymouth, Devonport, Brighton, Hastings, and Southampton. Between Torquay and Southampton there is a difference of just 50 per cent.; the rates and water charges on a house rented at £50 amounting in

the one case to £14 per annum, and in the other to £21. When the gas bill is added to the cost of the rates and water, Plymouth is an easy first, Portsmouth being second, Devonport third, Torquay fourth, Brighton fifth, Hastings sixth, and Southampton seventh. Naturally the value of this calculation depends upon the consumption of gas; it is therefore interesting to ascertain what this is taken at. In Plymouth, the average gas consumption appears to be 38,100 cubic feet per annum in houses rented at £30, 48,400 cubic feet in houses of £40, 100,400 cubic feet in houses of £50, 104,400 cubic feet in houses of £60, 110,300 cubic feet in houses of £70, and 142,700 cubic feet in houses of £80. If these figures are fairly representative of the gas consumption in houses of corresponding value in the other towns named, Plymouth's claim to be a cheaper place of residence than any of them may be taken as established. It is clear, however, that the sole credit for this is due to the Gas Company, whose enlightened and progressive policy has resulted in the maintenance of one of the cheapest supplies in the kingdom.

Valuation of Gas Undertakings.

When addressing the shareholders of the Bromley Gas Company, of which he is Chairman, Mr. Alexander Dickson usually has some remarks to make of interest outside his own particular undertaking. His speech at last week's meeting contained a pertinent reference to the valuation of gas-works for assessment; and he expressed the hope that some means would be devised of cheapening the methods of procedure in this connection. His own Company have just had the unpleasant experience of seeing their rating increased by 60 per cent. over the sum settled upon five years ago; and though they have so far succeeded in getting this reduced to an increase of about 40 per cent. upon the assessment previously fixed upon, they will still be called on—subject to their decision to appeal to Quarter Sessions—to pay additional rates to the extent of £700 a year. What this means to the consumers, Mr. Dickson clearly demonstrated by pointing out that the amount named was equal to between 1¼d. and 1½d. per 1000 cubic feet upon all the metered gas sold. Had, therefore, this reduction not been made, the Company would have been able to lower the price of gas by 2d. per 1000 cubic feet instead of by the 1d. now contemplated. As it is, the reduction announced will bring the gas down to 2s. 11d. per 1000 feet; but it is only fair the consumers should be made to understand that the method of rating at present in vogue with regard to gas companies directly prejudices them by taking in rates out of the concern money which would otherwise, by statute, revert to them in a diminution of the price of gas. Perhaps now that the matter has been so clearly put before them, they, as well as Mr. Dickson, will wonder why the method of rating upon a structural rent, as in the case of an ordinary trader, and altogether apart from any consideration of the profits of the business carried on, should not equally apply to gas companies.

A Prosperous Suburban Company.

The West Ham Gas Company are also exercised on the subject of their assessment, which has been put up to such an extent that the Directors have been driven to appeal against it. We all know how badly money is needed for municipal purposes in West Ham—with their expensive electric light undertaking, and other luxuries—and so can understand their desire to raise the assessment of companies trading in their midst; but at the same time the Gas Company does not exist—either solely or partially—for the purpose of helping them out of their financial troubles. West Ham is a "Progressive" place; and the Gas Company are also progressive, but in a way that is much more promising for those who have a monetary interest in the results of the policy. Hitherto we have not had the pleasure of reporting the meetings of this Company; but an account of the proceedings at the half-yearly gathering last week (the first occasion on which it has been held in London) appears in to-day's issue. Among other interesting matters, Mr. J. Lister Godlee, the Chairman, was able to announce that the capital employed per 1000 cubic feet sold was 4d. less than it was a year ago, and that they had this year made 12,257 cubic feet of gas per ton of coal and oil, and sold 11,535 feet per ton—or nearly 1000 feet more per ton than in the first half of 1903. He spoke highly of the assistance rendered by the water-gas plant which has been installed, and said that it was largely responsible for the results obtained. It will be seen that the Company are having a very busy time with the fitting up of prepayment meters. There are already nearly half as many automatic as ordinary consumers; and besides a huge number of applications, which are awaiting attention, fresh ones are continually coming in. In connection with this matter, an interesting point was brought out by Mr. Godlee, when he stated that the cost of collection from prepayment meters worked out in practice at rather less than 1½d. per 1000 cubic feet, against about ⅓d. for ordinary consumers—making the extra outlay for getting in the money from automatics 1d. per 1000 cubic feet.

Gas Companies and Local Authorities.

Main-laying operations are, in one form or another, a fruitful source of dispute between gas companies and local authorities, partly, perhaps, because it is impossible for work of this kind to be performed without inflicting a certain amount of inconvenience upon somebody. To find a road "up" is, of course, annoying—however necessary the disturbance may be—and very properly penalties are provided in the event of there being "unreasonable delay" in restoring things to their original condition. There is thus a means at hand of hurrying the company on, if they should fail to carry out the work with due speed—which is hardly likely to be the case, as it is to their interest to get rid of the responsibility of the open road as rapidly as is compatible with good workmanship. But even if they had no direct interest of this kind at stake, why cannot gas companies be more often given credit for doing the best they possibly can for all parties concerned? Why not regard them as the friends of those by whom they live, and not so frequently as their enemies? Gas administrators in general can at least claim to be considered fair men of business; and therefore, seeing that (as Sir George Livesey pointed out at the meeting of the South Metropolitan Gas Company last week) they no longer have control of a practical monopoly of artificial lighting, but are subject to severe competition, it might be conceded as a broad principle that they would be not only willing, but anxious, to retain the good-will of their customers. Would it not more often be possible for local authorities, instead of regarding the gas company in their particular district as a set of tyrants desirous of generally riding roughshod over the community, to look upon them in a more friendly light? Disputes, of course, there must be; and nobody can complain of councillors doing what is necessary to safeguard the interests which for the time being are confided to their care. But our suggestion is that this might, more often than is the case, be done in a friendly manner, instead of having recourse to law. When all other means have failed, then certainly invoke the aid of Judge or Magistrate; but these other means should be given a fair trial first. If this were always done, much needless trouble would be saved, and we venture to assert that in no possible respect would anyone be a penny the worse. On the contrary, both parties would benefit by the endeavour to remove, rather than to create, friction. It is difficult to understand why some local authorities find it so hard to "approach" the Directors of a gas company; but it is easy to see that to do so does often "go against the grain." Only the other day, it was contended by certain members of the Chard Town Council that if the Corporation would only go to the Directors of the Gas Company, a way would soon be found out of their difficulties regarding the taking over of the works. Of course, in the particular case of Chard there may be no ground for the hint thus given that endeavours have not been made to come to a friendly agreement. But in only too many instances there is good reason to suppose that if a really serious effort were made, it would result in the amicable settlement of disputes which otherwise have to be decided in a Court of Law.

A Main-Laying Dispute.

A case was heard at Dartford last week, and is reported elsewhere to-day, which it is difficult to believe could not, with a little trouble, have been disposed of without the assistance of a Bench of Magistrates. The Erith Urban District Council felt called upon to apply for a string of summonses against the West Kent Gas Company for the dire offence of opening various streets in their area without giving the necessary three days' notice of their intention so to do. There were no less than eight summonses

taken out; but even then the Clerk to the Council thought himself entitled to some credit for magnanimity, for he stated that the facts would have justified him in asking for no less than seventeen. However, the hearing of the eight on which he relied turned out to be a waste of time, for they were dismissed—albeit in a somewhat illogical manner, for the Company were ordered to pay the costs. No doubt they were satisfied to gain their point at this small sacrifice, though they would have preferred that the costs should have followed the event in the usual manner. The alleged offence was altogether a technical one; and it was rather hard upon the Company that they should be haled before the Magistrates in connection with an endeavour to reduce the price of gas to their consumers, whose interests, of course, are identical with their own. The main over which the dispute arose was one laid from Erith to Crayford, so as to do away with the necessity for manufacturing at the latter place; the object being to get rid of a very high charge previously incurred for the cartage of coal. Various unavoidable delays occurred in carrying out the work—one at least of which was caused by a demand on the part of the Surveyor that, wherever possible, the main should be laid with 3 feet of soil between its top and the surface of the ground. Then there was a bridge to be crossed; and, with regard to this, negotiations took place between the parties. However, "unnecessary delay" was not urged, or different proceedings would have been open to the Council. The case mainly turned on when the laying of a main could be said to be completed and the road re-instated. While laying the main in question, the Company took advantage of the opportunity to put down a set of telephone wires for the purpose of signalling when the holder which it was intended to serve was full of gas. No objection was taken to the cable containing these wires when it was being laid; but the right of the Company to lay it was disputed at the hearing of the summonses. The Surveyor, of course, saw it being laid; but he explained to the Court that he did not know what it was, and thought it was more like a piece of string—a statement which was received with some astonishment by the Chairman of the Bench. The Company contended that the work of which they had given notice to the Council was not finished until the whole of what had been put down had been tested; while the Council held that when the pipe was once laid and the trench filled in with earth (which was done for the convenience of the traffic), the operations covered by the original notices of the Company were completed. A most interesting point, no doubt; but surely one that was capable of adjustment without recourse to the Magistrates. The Company were not doing the work in the manner they did for the sole purpose of annoying the Council.

The Audit of Municipal Accounts.

Judging by an answer given by the President of the Local Government Board to a question put to him by Sir Gilbert Parker last Tuesday, the appointment of a Departmental Committee to deal with the auditing of the accounts of local authorities, though for a time in abeyance, will in due course take place. The Conservative member for Gravesend was desirous of ascertaining whether the appointment of the Committee would be preliminary or supplemental to, or in substitution of, the conference unanimously recommended by the Joint Committee on Municipal Trading; and if not in substitution, at what date the conference would be convened. If, however, it was to be in substitution, he inquired the reasons for disregarding the report of the Committee. Another matter upon which Sir Gilbert desired information was as to the steps that will be taken to give effect to the Committee's recommendation that it is desirable that the opinion of professional accountants should be obtained as to the best means of prescribing and auditing the accounts of local authorities. Mr. Long was able to assure his questioner that the object of the Departmental Committee will be to deal with the matter raised in the paragraph of the report of the Joint Committee as to the practicability of a standard form of accounts for local authorities being prescribed; and he contemplates that in connection with it the opinion of professional accountants will be obtained. He is only concerned with the accounts of local authorities in England and Wales; and he thinks that by the adoption of the course he proposes, he will obtain expert evidence of the kind referred to in the question, and also other evidence which it is desirable he should have to enable him to decide as to the form of accounts.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 485.)

Business on the Stock Exchange fell very quiet last week. With the August holiday month in its second week, and with the general tendency to inactivity which all markets have sunk into, there was little chance of any revival of business. The settlement pretty well monopolized what attention was forthcoming. The tendency, however, was, on the whole, rather better than the preceding week, especially towards the close. There was apparently less nervousness in regard to international questions arising out of contraband seizures; and although Consols had some ups and downs, they were less acute. The Money Market was very active; and the demand enabled good rates to be commanded. But the supply was fully equal to requirements. Discount opened rather stiff; but it eased off perceptibly before the close. Business in the Gas Market was of very fair proportions, when allowance is made for the time of year. Changes in quotation were few and slight; the general tendency being very firm and steady all round. The accounts and reports of most of the home undertakings are now to hand; and they fully confirm the anticipations we noted—that the first half of 1904 would prove to have been a favourable season for the gas industry. The chief and most satisfactory feature is the increased and increasing demand for gas, which is the paramount business of the companies. Sales of residual products must, and will, vary largely, and will be affected by local conditions; but to sell gas is the great thing. In the Gaslight and Coke issues, transactions in the ordinary stock were up to a very fair level, and good prices were maintained. The figures ranged from 95⅝ to 96⅜ *cum. div.*, and from 93½ to 94 *ex div.* on Friday and Saturday. There was a fair amount of business done in the secured issues at pretty good figures, though the debenture was still affected by the flatness in gilt-edged securities. South Metropolitan was brisk and active, and commanded nice prices. The figures ranged from 127 to 128 *cum. div.*; and there was one deal at 125¼ *ex div.* There were no dealings in Commercials. The accounts of this Company are very satisfactory, enabling them to pay the full statutory dividend, and to carry forward a materially increased balance of profits in hand. Very little was done in the Suburban and Provincial group; and changes of quotation were limited to those arising from *ex div.* adjustments. The Continentals were scarcely touched at all. European changed hands at top price; but Union preference had a setback. Among the remoter undertakings, the only change was an advance in Oriental. There is still a little business being done in Water Stocks, which are now practically so much Metropolitan Water Stock to be taken at certain rates of exchange. In common with other gilt-edged securities, some of the debenture stocks were easier.

The movements in Gas were: On Thursday, Continental Union preference fell 2. On Saturday, Oriental rose 2. In Water, Chelsea and West Middlesex debenture stocks receded on Tuesday and Wednesday.

ELECTRIC LIGHTING MEMORANDA.

The Effects of Competition in the Electrical Manufacturing Industry—Free Electric Incandescent Lamps or Maintenance—Specious Arguments for Canvassers.

Notwithstanding the constant intelligence of new and extending work in the electrical world, the condition of electrical plant manufacturers appears to be of a parlous nature. At the present time, the amount of work in hand and the quantity of goods turned out is greater than ever; and yet the manufacturers' returns, and consequently the dividends, have in these years, when the zenith of electrical activity may be said to have been reached, dropped to what might be expected to obtain when work is at its minimum, with the further result that the market prices of the shares of many of these manufacturing concerns are to-day standing below (in some cases much below) their nominal value. It cannot be denied that the best of the firms have kept themselves well abreast of the times. Their works bear testimony to enterprise in all directions, in order to produce the highest mechanical efficiency on the most economical lines; and yet they are found to be on the down-grade as profitable businesses. To let themselves fall to the rear in enterprise would be fatal to these firms; but even the upholding of reputations cannot possibly save them all, unless there is a speedy change in the present perilous state of things. After what has just been said, we cannot allow as true that depression of trade in the electrical world is the reason for the existing position. Then what is it? It is that, great as is the activity, the industry has been swamped by producers. It has been left to Mr. John Trotter, the Chairman of Messrs. Crompton and Co., Limited, to boldly face the truth, and to speak upon it, at the meeting of his shareholders, without any attempt at veneering the facts. Severe competition not only for work, but existence, and the consequent cutting of prices, is at the bottom of the trouble. All the steps taken by the firm to

cheapen processes have, it is confessed, been nullified by a steady drop in the regular goods made by electrical manufacturers; and this is continuing. Mr. Trotter finds that, only in the last few months in the price lists of competitors' goods, there has been a drop in prices varying from 10 to 25 per cent. As to public contracts, these, too, are not worth having, because of the prices now quoted to secure them. In one case only recently, sixty tenders were sent in; whereas a few years ago there would have been only three to six. For many of the firms, the work is disappointing and discouraging; and there appears to be no prospect of any early improvement. The only hopeful way of bettering the position that Mr. Trotter can see is the weeding out of the weaker concerns. This, however, is a tedious process. It is, of course, those who are financially strongest who will survive; but the weaker ones will not give up until the struggle has been carried to the bitter end. The outlook is anything but a cheerful one for those who have invested money in the manufacturing branch of the industry. Many of them have suffered loss through reconstruction and writing-down of capital; and now dividends are either unknown or are undergoing rapid decline. The end may be ruin for not a few who were originally attracted by the brilliant prospects held out to them. But we are charitable enough to hope that it may not be so.

There has been a great discussion going on in the electrical papers, during the last few weeks, anent consumers' incandescent electric lamps. There is no doubt electricians find themselves beset with increasing difficulties in securing extended private business by the assiduous attentions of the gas people to their consumers. The idea has been started that incandescent lamps should be supplied free, or on specially favourable terms, as a means of encouraging the greater use of electricity, and of helping to prevent present consumers sliding back into what some of our electrical friends would describe as the degradation of using gas for lighting purposes. Electric incandescent lamps are not of those things which improve with age; and the consumers are found to blame—history repeats itself—the electricity rather than the lamps for the growing deficiency of illuminating power. Besides this, it is found that consumers will go to the cheapest market for their lamps, without giving any consideration to the question of efficiency. About the efficiency of lamps, they know little or nothing; and they, more often than not, look upon one type as being as good as any other. What the electricians are therefore discussing is how to meet these two conditions—the want of care on the part of consumers in the choice of lamps, and the activity of the gas people among their consumers. Opinions are divided. There are those who would give free lamps, or who would supply them at low prices, while others are dead-set against anything of the kind. Free lamps! There can be no such things in a business such as electricity and gas supply; and the person who pays for them in the long run is the consumer. The lamp may be handed to him without special charge; but its cost is met out of the revenue received for electricity, and therefore must be included in the price charged per unit. This being so, it is a matter for consideration whether it is not better, in the interests of an undertaking, to adopt some other course than to attach extraneous charges to the cost of electricity which keep the rate from being reduced to the extent of such charges. A writer in the "Electrical Review" deals with the question from the municipal standpoint. He objects to the public funds being used in this way, and is not satisfied that, under municipal supply, the consumers would get the best lamp, because, "municipalism plumps for the cheapest article, and the lowest tender is accepted." In this way, in one respect, the consumer would not be better off than he is now. In addition, this writer is opposed to the destruction of the local retail trade; and he is of opinion that the competition between manufacturers for municipal orders would eventually lead to combination and putting up of prices. This would defeat the object in view. In the "Electrical Times," two or three engineers who are interested in both gas and electricity supply suggest the taking of a leaf out of the book of experience in the gas industry, by going in for the maintenance of electric lamps, and taking every conceivable opportunity for educating the consumers in the proper use of electricity. This is wise advice, and far preferable to the "free" lamp delusion.

We have not been favoured with a copy of a little book, entitled "Specific Reasons why Every Tradesman should Use the Electric Light," by Mr. C. Rockley; and therefore for this notice of it we have to admit our indebtedness to the information contained in the reviews of it in the electrical press. Mr. Rockley's qualification for writing on the subject appears to be that he has for several years been the official canvasser and general outside representative of a municipal electric supply department; and he believes that his experience may be useful to other canvassers. It seems that among other things, Mr. Rockley states that gas gives off heat which plays "the dickens" (quoting from the "Electrical Times") with the grocer's goods by drying moist sugar, cheese, currants, &c., thereby causing them to lose weight, and by promoting fermentation in jams and sauces on top shelves! One would imagine from this that the sage Mr. Rockley labours under the impression that electric lamps do not give off heat. On Eastbourne Pier, there is a show-window containing silver goods; and the window is lighted by incandescent electric lights close to the glass front. Although exposed to the open sea, and at night time when the outer temperature is the lowest in the twenty-four hours (it is well to be precise), in the neighbourhood of the lights, the glass front is quite hot, and to the hand unbearably so near to one of them. This is not exceptional, but only a good illustration. Our canvassing author will next be advising grocers to darken their shops in the day time in summer, and use the electric light, to prevent the sun drying their goods. Perhaps he will excuse us thinking that there would be rather greater humidity about the atmosphere of a gas-lighted room than in one electrically lighted. The boot-maker, we learn, may also be won from gas by telling him that, if he takes the electric light, the "elastic sides" of his boots will not perish as heretofore. "Elastic-sided" boots are not just now fashionable, Mr. Rockley. Then the butcher may be told that gas products speedily discolour frozen meat; the hosier that shirts, collars, and cuffs turn yellow when placed in the upper part of a gas-lighted window; and the furniture dealer that [this is a good thing for the buyer] cheap furniture "sweats" in the gas-lighted show-room. What a wonderful thing it is that the gas-lighting of shops has been going on for over a century; and that tradesmen have suffered so long from it, and are still so imperturable over it, that it requires such trash as this to convince them of their folly. Why was it that the tradesmen in the Birmingham market—the butchers, the fruiterers, and the flower sellers—supplemented the electric light a few years since by gas-lights? If Mr. Rockley does not know, and will communicate with us, we will gladly turn up a reference to the matter in a past volume of the "JOURNAL" which will give him all the necessary information.

RECOVERY COKE-OVENS.

SINCE the paper which was read by Mr. Charles Hunt at the meeting in 1896 of the Incorporated Institution of Gas Engineers, entitled "Notes on Residuals," in which was given a description of the Semet-Solvay recovery coke-oven, and the results obtained therewith at the Brymbo Steel Works, near Wrexham, the subject of recovery coke-ovens has been one of recurring and increasing interest to gas manufacturers. Many are now found to believe in the possibility of an economical application of this system of carbonization as an ordinary gas-works process. The idea with which the author of the paper started was that, inasmuch as these recovery ovens were the means of throwing upon the market a considerable quantity of bye-products—tar and ammoniacal liquor—which seriously interfered with the disposal of similar bye-products from gas manufacture, it might be possible to engage the system as an ally of the latter—to make hard coke for those who wanted it, and distribute the gas to consumers. To fulfil such a programme, a demand for hard coke would be necessary, so that the system could only be applied with advantage when this existed. At the present time, however, efforts are being directed to the manufacture of coke by this means, similar in character to that which is produced in an ordinary gas-retort. The chief advantage to be thus gained by the adoption of the oven system would be the saving of labour by charging and discharging in bulk. Something also might be saved in upkeep, since the wear and tear of ovens can hardly be so great as that of gas-retorts.

When Mr. Hunt commenced the investigation of which an account is given in his paper, it does not seem to have occurred to the users of these recovery ovens that any particular value attached to the gas produced from them, except for the extraction of the tar, ammoniacal liquor, and benzol. After such extraction, the gas was used to heat the ovens, and any not so required was burnt to waste. It is related in the paper, however, that samples of the gas were taken which, on analysis, gave evidence of its substantial identity with the gas produced in the ordinary way at a gas-works. Further samples being taken, showed "large and irregular dilutions of atmospheric air," owing to the exhauster not being under proper control. "This defect," the author states, "being remedied, a marked improvement in illuminating power was the result; and the gas has since been used satisfactorily for lighting the works and offices, displacing the gas which was formerly manufactured for this purpose."

Thus was established, and for the first time, the identity of oven gas with that which is produced by the ordinary gas-works process. An installation of 400 recovery coke-ovens was, a few years later, operated by the New England Gas and Coke Company, at Everett, Massachusetts; one of the objects being to utilize the gas by distributing it for heating and lighting. This, owing to the surrounding circumstances, has not hitherto proved a commercial success. A similar enterprise has recently been embarked upon by the Milwaukee Coke and Gas Company, who expect, when their extensive plant of eighty Semet-Solvay ovens are at work, to have a surplus of about 3 million cubic feet of gas a day, of which they desire to dispose. Each of these ovens, it may be said, requires, every twenty-four hours, 7·5 tons of coal; and the product of the twenty-four ovens already at work, runs to about 130 tons of coke per day. When the eighty ovens are operated, the daily product will be somewhere between 450 and 500 tons.

It is apparent from the above that the subject of recovery coke-ovens is one that appeals to the gas manufacturer as well as to the metallurgist; and hence our interest in the paper which was

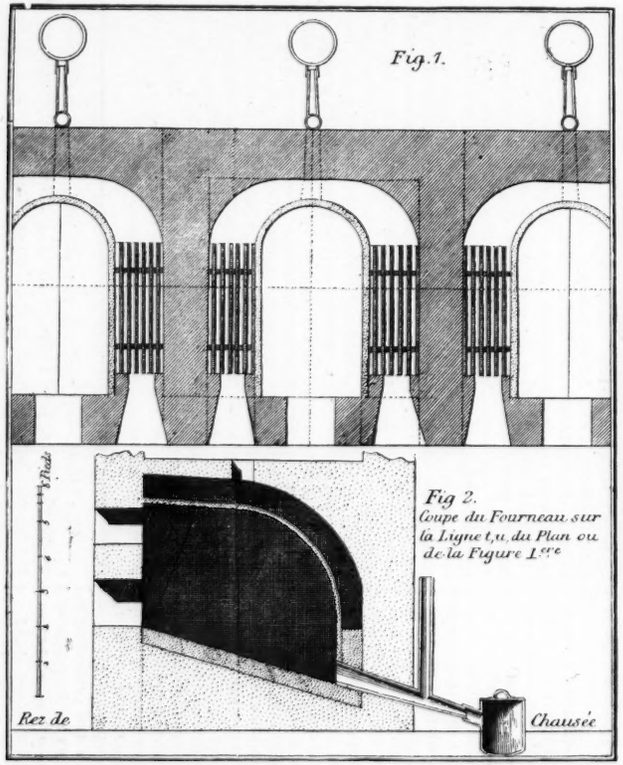
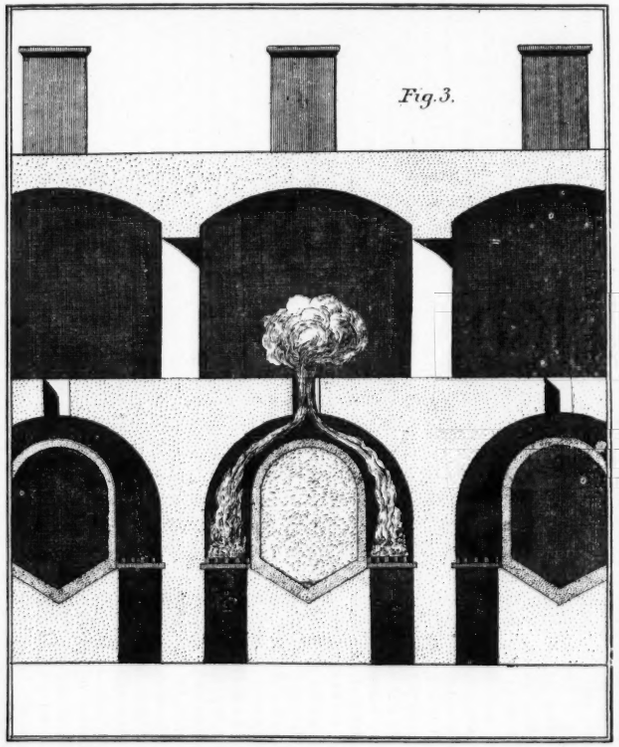


Fig 2.
Coupe du Fourneau sur la Ligne t, u du Plan ou de la Figure 1ere



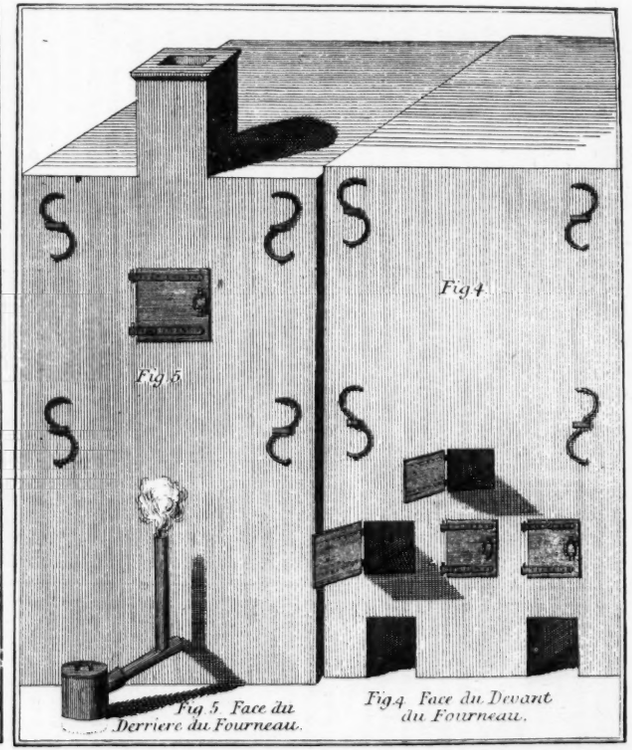


Fig 5 Face du Derriere du Fourneau.

Fig 4 Face du Devant du Fourneau.

read in April last by Mr. Paul J. Mallmann, M.A., before the Cleveland Institute of Engineers, entitled "Coke-Ovens and their History." The latter, however, it may be said, is disposed of very shortly by a brief reference to the antiquity of coking processes. Charcoal burning, it is said, dates at least as far back as the days of Homer. We are not at all sure that, in any history of this subject, this art is not deserving of something more than mere passing reference, having regard to the importance of the industries which are connected with it. For instance, the excellent quality of Swedish steel is proverbial; and this is largely due to the use of charcoal in its manufacture. The system of coking which has been in vogue for ages—namely, that of picking up coal or wood, and covering up the heap, leaving only an opening at the top through which the contents are fired, is still employed in many places. If we are not mistaken, it is used in South Staffordshire for making forge "breezes." The first attempts at coking coal in beehive ovens were made in the beginning of the seventeenth century; the first patent taken out for this form of oven bearing date 1620.

From this there is a long gap in the author's historical sketch, extending to 1781, in which year, Archibald, Earl of Dundonald, obtained a patent for what he describes as the first bye-product recovery oven. It was not, however, fired by external heat, but by the admission into the oven of carefully regulated quantities of air, by which combustion of some of the contents of the oven was maintained. Nor was it, as the author supposes, the first of its kind. It is, however, specially interesting to gas men, because the current of gas escaping from these ovens was frequently fired; and it has even been said that Culross Abbey, the residence of Lord Dundonald, was lighted up by this means. This, however, is incorrect. What was actually done with the gas, of which there must have been a considerable quantity, though of indifferent quality, was told by Mr. John Hart, in the discussion which followed the reading of a paper on "Coal Gas" by Dr. Thomas Thomson, before the Glasgow Philosophical Society on Nov. 1, 1843. Mr. Hart, it appears, visited Culross Abbey, when it was unroofed, and in a state of ruin, and he examined the walls without being able to discover any trace of pipes. He was also informed by an old man who had acted as assistant to Lord Dundonald in his experiments that the workmen used to attach a cast-iron pipe to the outlet of the ovens, and light the gas to give them light during the darkness. His Lordship, also, burned the gas in the Abbey as a curiosity; this being conveyed for the purpose in a vessel resembling a tea-urn.

The first recovery oven of which any record exists was used for coking coal at the iron-works belonging to the Prince of Nassau-Saarbrucken, at Sultzbach, and is described by M. De Gensanne, in his "Traité de la Fonte des Mines par le Feu de Charbon de Terre, &c.," which was published in Paris in 1770. This oven is thus described: "Within a shed built for the purpose, several furnaces are arranged in line, and adjoining one another. Of these, three at least are being heated, while the others are being cooled. When the coal is half wasted in the first three, the next three are kindled, and again when the process in these is half complete three more are fired. Since the roasting occupies three times twenty-four hours, by this means three furnaces are drawn every day, and at least nine furnaces are worked continuously to supply the works."

Figs. 1, 2, 3, and 4 are reproductions from De Gensanne's work, of the illustrations of this furnace, which was in reality a gas

retort—presumably the first ever constructed on a working scale—and the real forerunner of the modern recovery coke oven. It consisted mainly of an arched chamber of solid brickwork, closed at the back and with doors in the front for firing. This chamber was about 6 feet long, and measured about 4 ft. 6 in. from the line of the fire-bars to the top of the arch. Running the whole length were two fire-grates, about 14 inches in width, and between these the floor of the chamber was raised to form a foundation upon which an internal sealed fire-brick chamber rested, which latter the author calls *the retort*. Below the grates, spaces were provided to form ash-pits, with doors for drawing the ashes. The inner retort-chamber was also arched, the sides being parallel to those of the outer chamber, with a space between the crown of the arch and the top of the outer chamber of about 9 inches. The bottom was depressed in the centre to form a gutter, and sloped rather steeply towards the back for the purpose of allowing the products of distillation to trickle down towards an outlet in the rear wall. A tapered copper drain pipe was securely built into this opening, and was led through the outer wall of brickwork, inclining downwards at the same angle as the floor.

The outer small extremity was inserted in the side of a cast-iron vessel embedded to one-half of its depth in the ground. A vertical branch pipe, 3 feet in height and 2 inches in diameter, was brazed to this drain pipe at the point where it emerged from the oven wall. The heavy tarry substances flowed down and were collected in the iron receptacle; while the volatile gaseous products escaped by the vertical branch pipe into the air. The method of working was as follows: After bringing up a sufficient supply of coal, well cleaned and graded to double the size of a man's fist, a workman entered the retort through the door, while another handed to him the coal upon a peel. This he built up carefully inside like a wall, taking great care not to injure the walls of the retort. As he filled up the chamber, he retired towards the door until there was just space enough left for him to crawl out; and he then continued charging from outside until every corner of it was completely filled. Both doors were then closed and luted up with the same material as that used in the construction of the retort.

The capacity of the retort or oven was ordinarily about 2000 lbs. of raw coal, for the "roasting" of which about 900 lbs. of the screenings from the same coal was used. As soon as the coal was sufficiently roasted, the pipe provided for the escape of volatile matter ceased to emit smoke, and the smell of sulphur observed throughout the operation became no longer perceptible. Coal thus roasted, continues De Gensanne, does not emit the least odour in burning, and possesses the further advantage of lasting twice as long in the smelting furnace as charcoal, as a substitute for which it can be used without the least inconvenience. Further, the oils and tarry substances which are given off in the process possess a value which almost covers the cost. These may be utilized in the following way: They are collected, as already mentioned, in a receiving vessel, the contents of which are poured into a large tub, and stirred for a long time with wooden stirrers. This forces the oil to rise to the top, where it is skimmed off with iron spoons. The bituminous matter settles at the bottom of the tub, and is sometimes pure enough for commercial use without further treatment. It is, however, more often mixed with water, which can be evaporated by heating in a boiler. By this action a woolly substance is formed, which is thrown away; the pure residue is of a fatty nature and very liquid, and is in no respect inferior to the best lubricating medium for the wheels of vehicles. As regards the oil, it differs from petroleum only in that, while the latter is very inflammable and flares up all at once, the oil from coal is much less so. It is suitable for use for lamps in country places, and is the only illuminant employed in the mines in Sultzbach; but it gives off a great deal of smoke, and a strong smell of naphtha.

We have translated at some length from De Gensanne's work because the subject is of considerable historical interest. That this furnace should have escaped mention by Mr. Mallmann is hardly surprising, seeing how rarely it has been noticed. It is mentioned, however, in the work on "Metallurgy," published in 1875, by Dr. John Percy, whose observations on it will be read with interest. Dr. Percy says: "The manufacture of oil for lamps and for the purpose of lubrication, by the distillation, at a low temperature, of cannel coal and other bituminous matters, is carried on largely in this country, and is reported to have formerly yielded a princely income to the firm of Young and Co. The oil thus produced contains paraffin, and is accordingly designated 'paraffin oil' by Mr. Young, who obtained a patent for his invention in 1850. Although the oils used at Sultzbach probably differed somewhat from paraffin oil, yet it is not a little singular that products obtained so long ago from the distillation of coal should have been employed as agents of illumination and lubrication, just as products also derived from the distillation of coal are now applied to the same purpose.

"The history of the process of coking at the iron-works at Sultzbach is interesting from another point of view, as showing how completely a great practical discovery may obtrude itself, as it were, upon the attention of men, and yet be unperceived. The chamber in which the coal was distilled was essentially a retort, and the gas, which issued in a continuous current from the vertical pipe at the back, must often have taken fire and produced a luminous flame. But the idea of applying that gas to the purpose of lighting seems never to have occurred to those who observed it. Large gas-works were daily in active operation at Sultzbach, and yet the merit of the invention of lighting by coal gas was reserved for Mr. Murdoch in 1792, or more than twenty years afterwards."

What about Minckelers in this connection? All that can be said here is that Minckelers was acquainted with this work of De Gensanne's, and with what was being done at Sultzbach, as is evident from the references to it which occur in his "Mémoire sur l'air inflammable tiré de différentes substances." Nor does he make any claim, either in that work or elsewhere, to be considered as the inventor of gas-lighting. This distinction seems to have been entirely of posthumous origin.

We are unable to follow our author through his description (which is accompanied by copious illustrations) of the various kinds of coke-ovens at present in use. Let it suffice to say that if ever the time should come when recovery coke-ovens are in request for gas-works, there will be plenty to choose from. They already number fully a dozen, from the original Simon-Carves direct-fired oven, which dates from the year 1862, down to the latest, which is a beehive oven, with bye-product recovery, the invention, bearing date 1903, of Mr. J. T. Key, who is known to many of our readers as having been formerly Engineer to the Sheffield Gas Company. Regeneration, it may be observed, is of recent introduction in connection with these ovens. The Semet-Solvay oven, which has been one of the most successful, is not heated regeneratively.

Much, however, remains to be done before the suitability of this system of carbonization for gas-works purposes can be said to be established. Hitherto, for example, a large portion of the gas generated—about 60 per cent. in some cases—has had to be used, after extraction of the benzol, to heat the ovens; and although producer gas is employed for this purpose at the Everett works of the New England Gas and Coke Company, more information on this point is greatly to be desired. Again, unless the production of "gas" coke be aimed at, it is probable that a washing plant would form a necessary adjunct to a battery of coke-ovens, and the cost of operating this is stated at about 1½d. per ton. On the subject generally Mr. John H. Darby gave some interesting evidence before the Royal Commission on Coal Supplies. From this it appears that the prejudice which formerly existed against the use of coke manufactured in these ovens is breaking down, and that actually 1s. per ton more is sometimes paid for the latter than for coke made in the old beehive oven.

For a production of 1000 tons of coke per week, requiring about forty ovens of the Semet-Solvay type, the cost of the plant is about £40,000, including compressing and charging plant, rams, sidings, coke hearth, boilers, chimneys, and bye-product plant complete. This is stated to compare with an outlay on the beehive oven for the same production of £13,480. From the recovery ovens an extra net profit of about £250 per week—or, say, £12,500 per annum—can be realized from the sale of the bye-products, using a 30 to 32 per cent. volatile coal. This seems an excellent return for an additional capital expenditure of £26,520; being something like 50 per cent. Recovery ovens, moreover, are credited with yielding about 70 per cent., of the weight of coal as coke; whereas the yield from beehive ovens is only about 54 per cent., owing to the combustion which is always taking place inside them.

The wonder is that so tempting a prospect has not yet resulted in the universal use of this type of oven. Fully one-half of the coke produced in the United Kingdom is, it is stated, still manufactured in beehive ovens—a circumstance which leads to sympathy with the remarks with which this paper is brought to a close. In these remarks there is the—shall we say customary—lament over the apparent decay of England's industrial supremacy, for which, whether real or imaginary, the author observes that Protection can be no remedy. He points out that "the work of the pioneers of the coke-oven industry has not been taken up by those who ought to have done so, not owing to want of mental capacity (we are obliged to him for this admission), but to a kind of mental lethargy which dislikes all innovations." "Foreign engineers," he goes on to say, "have taken up what English engineers had neglected; they have shown that the cultivated brain power of the foreign engineer was able to cope successfully with a question involving engineering and scientific knowledge in all its branches." In support of this, he shows that, whereas the whole of the English patents taken out in connection with this subject from 1620 to 1860 were, with one exception, of British origin, of those taken out from 1860 onwards, only three have been British, the remainder (21) being of foreign origin.

The figures are striking, certainly; but more may be made of them than the circumstances warrant. America, for example, is a great coke-producing country. How much of the coke made in the United States is the product of bye-product recovery ovens, and what proportion of such ovens in use are of foreign origin? If, as we suspect to be the case, a very large proportion, would it be fair to attribute this to "a kind of mental lethargy?" Surely not; nor is it true as regards our own countrymen. What, however, is, after all, the real explanation in each case may, for the present at any rate, be left undetermined.

The death occurred on the 4th inst., at his residence in Sheffield, of Mr. Joel Lean, M.Inst.C.E., the Chief Engineer of the Rivelin Tunnel works of the Corporation.

EXPERT WITNESSES' FEES.

CONSULTING engineers and chemists are a great power in the land, and not alone in the gas and water industries with which the "JOURNAL" is more particularly concerned. They are ubiquitous in all the walks of these industries, and are indispensable in numerous ways that need no specific mention. They are regarded in various lights by those who engage them—willingly or because necessity compels; and those lights again are such that those who seek professional advice and those who advise know them full well. It is, however, perfectly recognized by the former that there are consultants and consultants; and that it is not every man who sets up an office at Westminster or elsewhere, and commences "practice," who is really a fit and proper person from whom to seek counsel or to have as a witness. The man who makes the best consulting engineer, and who gains the greatest confidence, is one who has held high position in the practical work of the industry, who by sheer hard work and many years' experience has won that position, and who has earned for himself while in the service a good reputation in all branches—in gas or water engineering (say) and in commercial and works management. It is such men as these whose advice and witness are worth having and paying for. But the payment is a difficult question. There is no standard measure as to what are fair charges by professional men. Even in professional work, there is the "cheap and nasty;" while, on the other hand, the superior "standing" of a professional man must be recognized as a sufficient justification for placing a high price upon his services. The question of whether a consulting engineer or chemist overvalues his services is not one for discussion here; that is entirely a matter as between the consultant and his client.

But the gas and water industries, like others, are not without examples of experts who pile up the bill, either by exceeding their instructions or by putting in the maximum attendances possible for which an agreed or customary daily fee is strictly entered. We are happy to believe there are not many of these; but complaint has occasionally reached us of practices of the kind. This has been more particularly found in the case of the casual expert engaged in parliamentary work. Attendances have been known to commence directly a Bill has been listed; and these attendances have been consistently made, no matter how many days have been consumed by the proceedings, and the daily fee has been just as consistently charged in the account, though the witness may have passed through his examination several days before the end of the hearing is reached. In cases of this sort, excepting the leading experts (whose attendance is necessary for advising Counsel and for consultation in respect of negotiation and settlement), the witnesses are not required; and it is an iniquitous thing that men so engaged should, for their own personal advantage, take such liberties with their engagement, and unnecessarily and unfairly run up the expenses of what are at all times costly proceedings, whether for promoter or for objector. Aspirants to parliamentary and other consulting practice should remember that such selfish tactics as these will not be personally beneficial in the long run. "Once bit, twice shy," holds as good in this as in other matters. Clients are not likely to forget an injustice in respect of the fees they may be called upon to pay; and, in addition to skill, a reputation for moderation of monetary claim—for not unduly taking advantage of their engagement—will work to the greater ultimate benefit of the occasional or would-be constant practitioner. Of course, the remark would equally apply to those in regular practice; but there are few of them who have not learnt its truth, and act accordingly.

The opening for these observations has been given by the action in which Professor Henry Robinson sought to recover £401 for professional services rendered to Earl Cadogan in advising him in regard to his opposition to a sewage scheme proposed by the Corporation of Bury St. Edmunds, where his Lordship is one of the principal landowners. Professor Robinson is not, of course, to be ranked with the casual experts referred to above, but is a consultant of a great many years' standing. Yet Mr. Justice Lawrance has held that even Professor Robinson has been guilty of exceeding his instructions, and of making an exaggerated claim on Earl Cadogan. His Lordship asked for advice as to whether the sewage scheme adopted by the Corporation would serve its purpose, and put an end to the nuisance of which complaint had been made. But the Professor went beyond this, and prepared an alternative scheme. It was, of course, not the business of Earl Cadogan to establish that a scheme propounded by Professor Robinson was better than one planned by the Corporation's own expert. All that he was concerned about was as to whether that of the latter was sufficient for the purpose in view. Mr. Justice Lawrance has very properly held that there was no retainer on the part of the defendant to the plaintiff to prepare an alternative scheme; that the claim was exaggerated; that, if the work was done, it was absolutely unnecessary; and that it was not brought to the notice of the defendant that it was done. For the future, among the rules of conduct of professional men should be placed the dictum of the Judge that, "when a skilled professional man is employed to conduct the business of another person, and it turns out that greater expense should be incurred than is in the contemplation of the employer—whatever the legal right may be—the moral duty of the professional man is to warn his employer." His Lordship decided that a sum of money paid into Court by the Earl was sufficient to meet the claim; and he therefore gave judgment for him, with costs against the plaintiff. There is abundant counsel and warning in this case for all who have to seek advice and for those whose advice is sought.

PERSONAL.

In the report to be presented by the Directors of the Weymouth Consumers' Gas Company at the meeting of shareholders on the 25th inst., they express their regret at announcing that, after 23 years of faithful service, Mr. JAMES LOWE has decided to retire from the position of Manager and Secretary at Michaelmas next. They record their appreciation of his skill and keen attention to the interests of the Company; and testify to its present satisfactory condition being largely due to his efforts. Mr. Lowe will be succeeded in the management by Mr. DOUGLAS F. COLSON, son of Mr. Alfred Colson, the Gas and Electrical Engineer of the Leicester Corporation. Mr. Douglas Colson was educated at Milton College, near Rugby, with the view of becoming an engineer. On leaving school he was articled to his father, under whom he received a careful mechanical and technical training. He has been engaged upon considerable extensions of works, and for the past two years has been the Chief Assistant at the Aylestone Road works of the Leicester Corporation. With regard to the other position to be relinquished by Mr. Lowe—that of Secretary—we understand that the Directors were advised, when considering the appointment of a successor, that severance of the offices would be desirable. They have accordingly entrusted the secretarial duties to Mr. E. Y. WOOD, who is at present the Accountant of the Company. We cordially wish Mr. Lowe many years of rest in his retirement, and the two gentlemen who follow him success in their respective spheres of labour.

A REVIEW OF THE CAPITAL EMPLOYED IN THE GAS INDUSTRY BY LOCAL AUTHORITIES.

By C. E. JONES, Assoc.M.Inst.C.E.

INTRODUCTORY.

Two years ago, a statistical examination of the accounts of most of the gas companies in the United Kingdom—with special reference to capital expenditure, production, and sale of gas, mileage of mains, number of consumers—was made, and discussed at some length, by the writer.* In this *résumé*, he proposes to render a similar service to the section of the industry comprehended under the ownership and administration of local authorities, and which, for reasons then given, were omitted from the former inquiry. The convenience, if not the wisdom, of confining the former review to the undertakings of gas companies, leaving those owned by municipalities for separate treatment, will be manifest to those who have laboured in this interesting field of arithmetical examination; and it is hoped that the method adopted will commend itself to the general reader and also to the officials of both divisions of the gas industry. Apart from the growing importance of the interests represented by the gradual absorption and municipalization of businesses created by private enterprise entitling them to separate consideration, the differences in the commercial policy and administrative practice of directional bodies, render the criteria more easily available, valuable, and complete, enabling comparisons between the results obtained under elective councils and those of the less popular courts or boards of directors to be readily instituted. It is obvious that data on any other basis would lack the essential elements of mutual intercomparison, reliability, and usefulness.

COMMON IDEAS REGARDING CAPITAL.

The acquirement of gas undertakings, either by agreement or compulsory purchase, as prosperous concerns earning and paying substantial dividends, is probably responsible for the prevailing impression that therefore the gas capital of local authorities is unduly inflated, by reason, among other things, of the goodwill of the business, unearned increment, and costs of acquisition. There may be some grounds for these gaseous conjectures in certain cases; but an analysis of nearly 250 comparable works does not appear to justify any such general hasty or exaggerative conclusion. When gas-works, however, are classified in groups according to their equal or similar carbonizing capacities, they exhibit less diversity with regard to the employment of capital than is commonly supposed (see table, p. 454); while, compared to that of gas companies, they have no reason to be ashamed.

EXPLANATION OF THE TABLE.

Over £35,000,000 is passed in review, and more than 5½ million tons of coal are dealt with. The works are classified in nineteen

* See "JOURNAL," Vol. LXXIX., p. 1677.

Group.	1. Coal Carbonized per Annum.	2. Capital Employed.	3. Gas Sold per Annum.	4. Capital Employed per Ton Carbonized.	5. Capital Employed per 1000 Cubic Feet Sold.	6. Miles of Main.	7. Coal Carbonized per Main-Mile.	8. Capital Employed per Main-Mile.	9. Gas Sold per Main-Mile.	10. Gas Sold per Ton Carbonized.	11. Number of Consumers.	12. Capital Employed per Consumer.	13. Gas Sold per Consumer.	14. Coal Carbonized per Consumer.	15. Number of Consumers per Main-Mile.
	Tons.	£	Cubic Feet.	£ s. d.	s. d.		Tons.	£ s. d.	Thousands.	Cubic Feet.		£ s. d.	Thousands.	Tons.	
A	3,196	38,308	20,669,040	11 19 8·68	37 0·81	35·00	91·314	1094 10 3·14	590	6,467	1,337	28 13 0	15	2·382	38·2
B	10,730	115,527	78,466,136	10 15 4·01	29 5·35	65·25	164·444	1770 10 6·89	1,202	7,312	5,157	22 8 0	15	2·080	79·0
C	58,927	636,293	497,429,964	10 15 11·51	25 6·99	297·50	198·073	2138 16 0·00	1,672	8,441	20,823	30 11 1	23	2·829	69·9
D	57,196	488,355	498,585,447	8 10 9·18	19 7·07	220·75	259·098	2212 5 0·88	2,258	8,717	21,459	22 15 1	23	2·665	97·2
E	73,863	670,801	624,963,450	9 2 2·10	21 5·62	247·25	298·738	2713 0 11·40	2,527	8,460	26,777	25 1 0	23	2·758	108·2
F	59,609	451,293	491,487,584	7 11 10·04	18 4·37	207·50	287·272	2174 18 1·44	2,368	8,245	22,563	20 0 0	21	2·641	108·7
G	41,393	371,807	383,141,508	8 19 7·76	19 4·90	123·00	336·528	3022 16 5·07	3,114	9,263	14,569	25 11 2	26	2·841	118·4
H	52,130	471,740	479,950,650	9 0 11·83	19 7·89	126·75	411·282	3721 16 3·50	3,786	9,206	21,688	21 15 0	22	2·403	171·1
I	66,805	656,088	606,896,106	9 16 5·02	21 7·61	181·75	367·565	3609 16 9·04	3,339	9,084	27,540	23 16 6	22	2·425	151·5
J	59,000	473,312	538,174,754	8 0 5·33	17 7·07	161·00	366·459	2939 16 6·26	3,963	9,121	22,240	21 5 7	24	2·652	138·1
K	86,625	636,384	790,829,107	7 6 11·14	16 1·12	215·75	401·506	2949 12 8·67	3,660	9,229	25,367	25 1 0	31	3·415	117·5
L	74,012	597,041	663,800,759	8 1 4·03	17 11·86	206·00	359·281	2898 5 1·74	3,222	8,928	26,261	22 14 8	25	2·818	127·4
M	92,098	902,339	888,296,089	9 15 11·41	20 3·78	288·00	319·784	3133 2 5·16	3,084	9,645	34,861	25 17 8	25	2·641	121·0
N	121,940	1,203,493	1,098,189,888	9 17 4·69	21 11·01	354·50	343·977	3395 0 3·72	3,097	9,005	52,885	22 15 1	20	2·305	149·1
O	202,845	1,719,492	1,934,674,848	8 9 6·45	17 9·30	497·75	407·523	3454 10 5·60	3,886	9,532	79,734	21 11 3	24	2 544	159·3
P	289,895	2,035,421	2,991,791,058	7 0 9·23	13 7·28	586·00	494·701	3473 8 3·52	5,105	10,320	112,699	18 1 2	25	2·571	192·3
Q	878,045	5,904,007	9,168,121,058	6 14 5·75	12 10·55	1855·25	419·374	3182 6 5·81	4,941	10,441	323,538	18 14 11	28	2·735	174·3
R	479,956	3,259,574	5,127,776,258	6 15 9·93	12 8·56	1277·75	375·625	2551 0 6·26	4,031	10,683	212,543	15 6 8	24	2 257	166·3
S	2,865,997	14,725,418	28,623,707,146	5 2 9·11	10 2·88	4643·50	617·206	3171 3 9·45	6,207	9,987	914,922	16 10 10	31	3·132	197·0
Total	5,574,262	35,356,693	55,506,950,850	—	—	—	—	—	—	—	—	—	—	—	—

groups, and the information is tabulated in fifteen columns. Thus, Group A contains gas-works using not more than 500 tons of coal a year; Group B, not exceeding 1000 tons; Group C, 2000 tons; and similarly onward, each group advancing by 1000 tons to Group M, which does not exceed 12,000 tons. Group N comprises works exceeding 12,000, but not 15,000 tons; O, 15,000 to 20,000 tons; P, 20,000 to 30,000 tons; Q, 30,000 to 60,000 tons; R, 60,000 to 100,000 tons; and S, all works carbonizing a greater quantity than 100,000 tons per annum. The works taken are those only which admit of comparability; combined gas and water works, and a few others not possessing these essential features whenever their inclusion would introduce a disturbing cause, are omitted. This, it is hoped, will enable those officials who take an intelligent interest in their business, and are desirous of advancing its prosperity, to compare their individual cases, and ascertain the exact position in the scale of efficiency of the undertaking committed to their charge. No places or names are given; nevertheless, any manager with an inquiring mind, without divulging trade secrets, or betraying his identity, can easily determine his position in the industry.

Columns One to Fifteen.—Column 1 contains, in tons, the quantities of coal carbonized in a year by each group respectively; Group A using 3196, and S 2,865,997 tons. Column 2 gives, in pounds sterling, the capital employed in all the works mentioned in the table. The gas sold by each group is set forth in column 3; and the capital employed per ton of coal carbonized is detailed in column 4. Column 5 gives the capital employed per 1000 cubic feet sold in each order of works. Over 29,000 miles of gas-mains (or more than sufficient to girdle the earth) are laid and utilized in the United Kingdom. Of this length, 17,554 miles are owned by gas companies, and 11,590 miles by local authorities, the allocation of which is stated in column 6. Thus Group A contains 35 miles, and Group S no less than 4643½ miles. Column 7 shows the number of tons of coal per mile carbonized by each group; the smallest using 91 tons 6 cwt. per mile, and the last 617 tons 4 cwt.—the mean quantity being 481 tons (nearly). It will be noticed that the capital employed per mile of main varies considerably; the smaller being the lowest. The next column shows the gas sold per main mile, which varies from 590,000 to 6,207,000. Column 10 details the number of cubic feet sold per ton of coal carbonized; the premier group being R, closely followed by Q and P in the order named—the mean quantity sold per ton for the three groups being 10,717 cubic feet. How far water gas is responsible for this high figure, will occur to the minds of many. The number and position of the consumers is next set forth, the capital employed to supply his wants, and the coal used to satisfy his requirements. Column 12 shows a variation of 100 per cent. in the capital required; the gas sold per thousand per consumer as per column 13 exhibits a similar diversity. The mean quantity of coal required to supply each consumer with gas is a little over 2 tons 16 cwt. per annum. The last column gives the number of consumers per mile of main, which varies from 38 in A to 197 in S; the mean of all groups may be taken as 169·7. Thickly populated districts, of course, show to the best advantage and *vice versâ*.

Mean Capital per Ton.

While a summary of all the groups yields in round numbers six guineas per ton carbonized, small works absorb three times this sum. In the case of the largest concerns, contrasts are less remarkable, although disparity is not altogether absent. In works using less than 3000 tons of coal per annum, joint-stock companies seem unable to conduct their business without a much larger capital expenditure than that incurred by the local authorities; but in the case of works using above 3000 up to 50,000 tons (which numerically comprises the bulk of the undertakings in the United Kingdom), the advantage is on the side of the companies. If, however, the works comprised in S, and which carbonize 50 per cent. of the coal used by local authorities, be averaged, the difference in favour of company management against that of the former is a little over 4s. per ton. Doubtless this is an appreciable item; but having due regard to the magnitude of the business, the diversity of local conditions, the want of continuity in direction—elective bodies, owing to changes of electoral opinion, being in a continuous state of transition—the substantial agreement of the two great divisions of the gas industry is noteworthy. Indeed, the process of assimilation is still going on, and extreme divergencies will in course of time become less remarkable, but will not altogether disappear.

Variable Factors.

Those, however, who contend that a uniform capital expenditure in all works should obtain, are assuredly doomed to disappointment; such an academical condition of things being absolutely unattainable. The factors themselves, being variable, any hope of uniformity or agreement must be abandoned. The elasticity of gas enterprise refuses to comply with cast-iron rules, Persic, or Median laws, which altereth not. Its capital, like too many gas-works, is unsymmetrical, inharmonious, and defies uniformity. Among the largest works, the ratio of capital to coal will vary over 540 per cent. There are twenty works (of variable capacity) which show an average or mean capital of less than £3 3s. per ton of coal carbonized. Similarly, twenty, equally divergent, yield a mean of £196 14s. per ton! Inequalities such as these seem inseparable from an industry which is never stationary, knows no finality, and is still displaying its wonderful powers of expansion; and while it is on all sides admitted that capital should be kept as low as possible, no standard expenditure per ton yet suggested is possibly applicable to all, or even to a majority of cases. The varying value of sites for stations, prices of materials and labour, and cost of the acquisition, will of necessity perpetuate disparity in the capital expenditure of gas undertakings, whether municipalized or not. As in the case of gas companies, discussed on a former occasion, to expect to find

in gas capital expended by local authorities uniformity is hopeless; but it may be said that the inequality displayed by the one is less extreme than the other.

Consumers.

Out of a total of 4,168,725 gas consumers, those within the limits of supply of local authorities include nearly 2 millions—a numerical factor inviting comment. Digesting the tables, we find this number to amount to 169·7 per mile of main. In the area supplied by private enterprise, the number is found to be only 125·6 per mile, or nearly 26 per cent. less than obtains under municipal management. This suggests either an excessive main-mileage in the latter, or a preponderance of small consumers attached to the undertaking. If the last inference be the correct one, it would appear that the companies either neglect or do not encourage the small consumer, or else find his custom unprofitable. It is difficult to reconcile this point, since, if he is unprofitable to the companies, he must be equally so to the corporations; and if profitable to the latter, it follows that his custom, however small, is a desirable thing for the companies to secure. Here is, therefore, an immense field in the domain of private enterprise lying fallow and ready for cultivation. Here is work for the canvasser, the gaseous husbandman and tiller, since, to bring the companies in line with their friendly rivals, it will be necessary to add a million names to the list of consumers. By the aid of prepayment meters, this should not present any formidable obstacle; and efforts in this direction will be viewed with interest.

Mileage.

There exists among local bodies, apart from electioneering devices, a strong desire to oblige their constituents, and to be considered "enterprising" and "progressive" rulers. Such sentiments have been, and continue to be, a conspicuous feature of modern municipal life; and the easy way that extensions, by means of loans raised on the security of local rates, can be effected, is perhaps an inducement to extend the supply of gas to unremunerative districts, or localities sparsely populated, in the hope that a profitable trade may ultimately be developed. This may help to explain excessive main-mileage, and the number of consumers to the mile. Joint-stock companies, on the other hand, insist upon an immediate return by means of a guarantee, or some financial consideration, on the outlay involved, and are reluctant to become philanthropists at their own expense.

Consumption.

In this department, companies are better equipped than local authorities, and manage to sell 5,251,000 cubic feet to the mile, against 4,881,000 cubic feet, or 10·85 per cent. more than their municipal competitors. This points to the fact that, given a fair field and no favour, the policy of Parliament entrusting the supply of gas to private enterprise is both popular and justified. For the local authorities to equal trading companies in sales of gas it would necessitate the carbonization of an additional 2 million tons of coal per year—a fact of some interest to sellers of gas coal. It may be remarked that, in addition to his domestic supply of coal, each gas consumer in the area supplied by statutory gas companies is responsible for 3 tons 17 cwt. 2 qrs. 2 lbs. of coal carbonized annually for his use. The quantity required per gas consumer within the limits of supply of local authorities is 2 tons 16 cwt. 3 qrs. 8 lbs.—a difference of over 1 ton in favour of company management. The average may be taken as $1\frac{1}{3}$ tons per consumer; and it is cheerfully recognized by the writer that it is within the limits of scientific possibility and local ambition for municipalities to accomplish the achievement of levelling up.

Nominal Capital not a Criterion of Value.

The temptation to arrive at the value of a gas-works by its capital, is strong, but fallacious. Estimates of value based on the nominal capital of an undertaking are, in many cases, misleading; and conclusions obtained in this manner are delusive. It is an ever-varying factor, and may or may not give fair values. Like man himself, it is inconstant and full of faults. This applies in varying degrees to both divisions of the industry—less marked perhaps in the case of local authorities than of joint-stock companies; but disparity in gas capital is to the manner born, and unavoidable.

Extreme Cases.

There are twenty municipal works with a mean capital per ton amounting to £3 8s. 9d.; but eight of these debit themselves with an average of £2 9s. 9d., and the remaining twelve with a mean of £3 13s. 1d. This is an interesting group with minimum capitals, and illustrates the operation and value of sinking funds and depreciation accounts. The difference even in this group between the highest and the lowest is exactly 100 per cent. On the other hand, there are twenty undertakings whose mean capital per ton amounts to £21 6s. 9d. Eight of these, however, average £24 15s. 2d., and the remaining twelve £17 18s. 6d. per ton of coal carbonized. In this group of maximum capital per ton of coal carbonized, the difference between the highest and the lowest is 42·15 per cent.

Official Facilities for Contracting Local Debt.

The ease with which a few persons constituting themselves the "local authority" can incur financial obligations and pledge the local rates for almost any earthly object, from a pulsometer pump to a palatial town hall or any scheme having the slightest pseudoscopic claim to sanitary or public improvements, is doubtless one of the causes of our colossal, and still growing, local indebtedness, which is rapidly becoming a danger to the State, and a hindrance to trade. It may be illustrated by an instance, trifling, but showing the ease, as conjurers say, with which it is done. Using the sums of a small though select group of works carbonizing between them a little over 1000 tons of coal a year, to supply fifteen miles of main, to which are attached the services of 366 consumers, we find the local authorities have borrowed an aggregate sum of £16,000, or a capital per mile of £1086 14s., in order to make and supply about $5\frac{3}{4}$ million cubic feet of gas to the aforesaid customers, who average 24 per mile, and consume 16,000 cubic feet per annum. The capital per ton amounts to £13 8s. 3d., and per consumer to over £44 10s.; the highest group in the large table being £28 13s. It thus appears to be an easy task to satisfy the suave inspectors of the Local Government Board that it is expedient to raise a loan on the security of the rates if only 100 consumers or less per mile can be obtained. This group sells 390,000 cubic feet per mile, or 16,000 cubic feet per consumer per annum; and this is held to be ample justification for mortgaging the rates of the localities respectively in order to erect or acquire gas-works. It is not surprising that only one of the concerns enjoys the high distinction of earning a small profit.

High Capital a Tradition.

The tradition then that the undertakings of local authorities who purchased by selection the best managed and most successful concerns are necessarily over-capitalized is untenable, and should be heard no more. A few such acquisitions may appear to adventurous buyers to have cost too much, and to the unwilling sellers too little. The point of view makes a material difference. Local authorities of the confiscatory order are seldom pleased if bidden to the feast in the words of Kipling's "Absent-Minded Beggar;" and the "paying" and conclusion of the transaction are especially painful to local democratic quidnuncs, who, more noisy than intelligent, have long been persuaded that the detested directors of any profitable and properly "regulated monopoly" should be executed forthwith, their property confiscated, aged and faithful servants reduced to penury, and gas undertakings bought for an "old song." But, fortunately for the national morality, the rights of property are still respected in this country; confiscation being popular only with the "have nots" and other romantic indulgers in Socialistic Utopias. Calmly and dispassionately reviewed, however, in relation to capital as a whole, this division of the gas industry must be pronounced to be in a sound and thoroughly healthy condition, possessing latent prospective potentialities awaiting development, which, under the stimulating influence of friendly rivalry, should quicken its commercial vigour, stimulate its dormant energy, and proclaim and extend the unquestionable usefulness of coal gas.

Overcapitalization forsooth! The market value of the site of many works alone, without manufacturing accessories, equals the sum by which it is represented in the accounts. There is no doubt, therefore, that local authorities have been able to acquire the pick of gas undertakings at a very moderate cost—such, indeed, as a modern trust or syndicate desiring, as is their wont, to purchase Nabothian vineyards would blush to offer. Much patience and great care are exercised in ascertaining the value of the contemplated purchase or hereditament, and it cannot be maintained, notwithstanding spasmodic outbursts of local indignation to the contrary, that arbitration tribunals have erred on the principle of awarding too much, even for going concerns compulsorily purchased, earning substantial profit, and who have always respected and observed their parliamentary and other obligations. The circumstance that gas undertakings have been secured at moderate prices says much for the common sense of umpires, who are generally men of mature judgment and high professional standing, and reflects credit on both parties, and cannot be other than gratifying to numbers of honourable gas committees who ably and unselfishly administer the gas affairs of their respective districts, and produce as cheaply as they can the staple commodity, promote by all legitimate means its extended use, and sell the article as near to cost price as is consistent with financial safety. It is idle to contend that all do this; but that some are striving to follow such an exemplary policy is a matter of encouragement and congratulation.

(To be continued.)

The Vienna Municipal Gas Undertaking Report for 1903.—The Municipality of Vienna have, according to the report and accounts recently published, reaped a handsome profit from the working of the gas undertaking during last year. The net profits are given at 3,035,018 kronen (about £126,460). The quantity of gas sold for lighting showed an increase of 3·07 per cent. over that for 1902; and the consumption for heating, cooking, and power an increase of 20·8 per cent. There was a falling off in the receipts for coke sold, owing to the cheapness of coal and the mildness of the weather. The disbursements include a sum of 150,000 kronen (about £6250) paid to the Imperial Continental Gas Association, and representing half the purchase price of a ten years' concession for the lighting of Schwechat, a suburb of Vienna.

IRISH ASSOCIATION OF GAS MANAGERS.

THE PRESIDENTIAL ADDRESS OF MR. JAMES WHIMSTER.

Delivered at Armagh, Tuesday, Aug. 16, 1904.

Gentlemen,—Conventionally, I presume I ought to preface my remarks to you to-day by an expression of thanks for electing me to this honourable position; but honourable as it is, I do not feel that I can honestly do so. As you know, I occupy it much against my inclination. In exchanging the secretarial garb for the presidential toga, I am in the position of one who has had to discard an easy fitting tweed suit for a brand-new, tight fitting, full-dress one. He does not feel at home in it. While I yield to none in a desire to see the Association prosper, and while I covet sincerely the goodwill and esteem of my professional brethren, I would much rather have dispensed with this honour.

As for the address which pertains to the position, having nothing new or striking to introduce to your notice, and not deeming myself capable of addressing weighty words of wisdom to an assembly of men having as large, if not a larger, experience of the ordinary duties of a gas manager as myself, I fear you will have to accept what may seem a very meagre production compared with the ponderous dissertations on many branches of advanced gas technics which have lately issued from the presidential chairs on the other side of the Channel.

Before proceeding further, however, allow me, in the name of the Directors of the Armagh Gaslight Company and myself, to give you a right hearty welcome to this ancient primatial city, with whose gas interests I have been identified for the past 21 years. I trust you will not regret your visit, and that the Armagh meeting may hold its own among the many successful gatherings of recent years.

In whatever remarks I may make, you will certainly expect me to revert to the formation of this Association. In August, 1887, I issued a circular inviting the gas managers all over the North to a preliminary conference in this city on the 9th of September of that year. Fourteen managers attended; and the "North of Ireland Association of Gas Managers" was launched. Of these fourteen, only four are of our number to-day—Messrs. Nisbet, sen. and jun., Mr. Frizelle, and myself. Most of the others have passed over to the majority. In 1900, as you are all aware, we changed the title of the Association to its present one, and entered the Twentieth Century as the "Irish Association of Gas Managers." The history of our Association has been one of uninterrupted success. We began with fourteen members and no funds; and now, after seventeen years, our ordinary members number 64, we have 24 extraordinary members, 1 honorary member, and a balance to our credit of about £50.

Over and above all this, I am bound to say there lies to the credit of the Association a vast improvement in the condition and efficiency of the gas-works throughout Ireland, as well as in the tone and capacity of the managers generally; for I am sure the members will bear me out when I say that they have received great benefit, not alone from the papers and lectures provided, but from their personal intercourse with their brethren at the meetings. They have received stimulus; and a spirit of emulation has been excited which has told upon themselves, and which has considerably benefited their employers.

Ireland has in many things a great deal to say; but in gas matters she cannot be so voluble. There are not many gas-works in Ireland at all; so that gas managers are consequently much isolated, and have much more need than their brethren in the Sister Isle for the stimulus of such an Association as this. The few gas-works there are, are mostly small; there being only five, I think, manufacturing over 100 million cubic feet annually. This shows of how little interest to us, so far as our own works are concerned, are those subjects which bulk so largely at the meetings of the Institution and most of the other District Associations, such as coal and coke conveying machinery, the relative working costs of machine-charged horizontal and inclined retorts, water-gas plants, &c.

The growing desire of municipalities to become the proprietors of the local gas-works is a subject of more or less interest to us all; and I am glad to say that recent events show that Parliament is meting out the same justice to gas companies on whose properties urban councils cast envious eyes in Ireland, as in England and in Scotland. The results of two recent arbitrations in the North—those of Ballymena and Omagh—must have staggered many urban councillors who were carried away by the idea that gas companies could be very summarily dealt with. Many seem to hold the opinion that an urban council can buy the gas-works at very little over break-up value, or, at the very outside, for the nominal capital of the company. But these two cases must surely have disillusioned them. In the case of Omagh, when the Company went for their Bill, they wanted the capital fixed at £15,000; but through the intervention of the Urban Council this was reduced to £12,000. The Council seemed then to have the idea that this practically fixed the price they would have to pay when they came to purchase; but the event has proved how far wrong they were, as the award was £26,880. In Ballymena, with a nominal capital also of £12,000, the award was £25,926.

Some years ago, I spoke to my Directors as to the advisability of procuring an Act of Parliament, or, at least, a Provisional Order, so as to put us in a better position if ever the Council should desire to purchase our undertaking. But, now it does not seem as if that were at all necessary, as Parliament is allowing full value, whether a company be statutory or not. All the difference would scarcely pay for the worry and cost of an opposed Bill. These conditions, however, must make it rather hard for the managers who pass with the concern under the control of the councils. The disappointment experienced at the difference between the price they have had to pay, and what they had been led to expect by the promoters of the purchase—which price is usually determined by the earning capacity of the business, and is calculated at so many years' purchase (just as in the case of land, but without the government bonus) and the consequent inability to make the undertaking at once pay the necessary interest and redemption money, and hand over the promised contribution to the rates—is likely to lead them to deal harshly with their officials. Of course, in the natural course of events, as we find is indeed the case in England and Scotland, business expands and profits increase, and eventually these dreams are realized. But, unfortunately, in Ireland, the stagnant condition of most towns, and the really retrograde movement in many, which is very discouraging in every way, tells much against these probabilities.

A great source of trouble and anxiety has come into most of our lives in the form of the steam-roller, which of recent years has appeared in our midst, and has been, I daresay, to most of us, as a horrible nightmare. But the steam-roller has come to stay; and we must just "face the music." My own experience of its ravages has been anything but pleasant, although I believe there are those who have suffered more. One of my neighbours was driven to advertise that he could not be responsible for maintaining an uninterrupted supply of gas owing to the numerous breakages that were daily occurring; but I am not aware whether or not his worst fears were realized. In my own case, the evil was accentuated by the circumstances under which steam rolling was begun. An extensive sewerage scheme was carried out in Armagh in 1901-3, in the course of which most of the streets were excavated to a great depth—averaging, I should say, 12 to 14 feet. Then, with a view to economy, the Urban Council arranged with the contractor, for a consideration, to relieve him of the upkeep of the streets for the specified term, and immediately set to work on them with the steam-roller. The result was that the sewer track, which had not been too well rammed and was not thoroughly consolidated, presented a weak point to the roller, which, beginning on the sides of the street, crushed the subsoil from under our pipes into the centre; thus undermining them to a large extent, and increasing the liability to breakage. At certain places, too, our pipes were actually built into the brickwork of manholes and flushing tanks; and when the roller came along, the pipes snapped just between the rigid and the soft.

What made the trouble still more serious was the fact that, as a rule, the old common rubble sewers were left to take the surface water. These usually ran alongside of our pipes, and when a fracture took place, the gas got into these old sewers, and instead of showing at its source, made itself felt at some gully a long way off—on one side of the break or the other, according to the direction of the wind. In several cases, too, the old subsoil sewers from under the houses discharged into these sewers, and thus the gas was carried into the houses, causing a very serious state of matters indeed; the locating of the break being such a difficult matter, necessitating the opening up of long stretches of main, which takes a good deal of time, especially during the short days of winter. So serious was the matter that we effected a third-party insurance to protect ourselves against claims for injury to property or life. Fortunately, nothing of a very serious nature has occurred. No doubt, much annoyance was caused in several cases; but I am hopeful that the worst is past, and now that the streets have been rolled once or twice, future rolling will not trouble us.

Now, as to the remedy for this sort of trouble. Of course, the "Man in the Street" says: "Lay your mains deeper." But this is easier said than done. Even when a main has to be lifted and replaced by a larger one, former levels have to be adhered to pretty closely, on account of obstructions that are sure to be met with at any other level, in the shape of branch sewers, water-pipes, &c., not to mention the connecting up of our own service-pipes *en route*. Great diversity of opinion seems to exist as to the proper depth at which gas-mains should be laid, though among gas engineers themselves the consensus of opinion seems to be in favour of a depth of 2 feet. In the litigation which has recently taken place between the Alliance and Dublin Gas Consumers Company and the Dublin County Council, the law on the subject of responsibility has been very clearly laid down; but the proper depth is still an "unknown quantity," which must be decided by the engineer himself according to circumstances.

In the action brought by the Dublin Gas Company in 1900, to restrain the County Council from using steam-rollers in such a way as to cause damage to their pipes, the Master of the Rolls, in delivering judgment in favour of the Company, said:

> The law gave one test, and one test only, as to the proper depth that gas-pipes should be laid under the road. There was no statutory enactment on the subject; and the only test the law supplied was that the depth must be such as to render the mains and pipes safe from injury from the ordinary traffic of the district in which they were laid. . . . What might have been the ordinary traffic of thirty or forty years ago would not, probably, be regarded as ordinary traffic to-day. . . . In this case the Company had laid their mains and pipes before

steam-rollers were used. At the time, the question of steam-rollers passing over roads was not dreamt of. . . . When the steam-roller came on the scene, what was the Gas Company to do? Was it to overhaul all its main and service pipes? That would have meant ruin. Was it to employ men to go after the steam-roller wherever it was used, and patch and repair as it caused injury to the pipes? That would have been equally ruinous and disastrous. . . . There were vast districts in the country where steam-rollers could be employed with advantage, where there were no gas-pipes, and where they could be used with safety. But their use could not be permitted in such places and in such manner as to injure the pipes of the Company, and to that extent an injunction would be granted.

The County Council appealed against this decision; but the Court of Appeal confirmed it. In delivering the judgment of the Court, Lord Justice Fitzgibbon said: "We wish to make the injunction more specific; and we make it an injunction against using any steam-roller on any road under which the gas-pipes of the plaintiffs have been laid so as to break or injure any pipes then properly laid under such road, regard being had to what at the time of the laying of such pipes were the then ordinary traffic and the then reasonable means of repairing and maintaining the road. The now reasonable means include steam-rollers of reasonable and proper weight, and the Gas Company will understand what the extent of their immunity is." He concluded: "From henceforth the Gas Company had better abandon the heroic style they adopted in their correspondence, which was as monstrous, as an assertion of autocratic right to control and use these roads, as was, on the other hand, the County Surveyor's decision that, no matter what might happen to the gas-pipes, he could run the steam-rollers anywhere he pleased."

These judgments appear to me to give a very clear statement of the law on the subject so far as responsibility for the safety of gas-pipes is concerned. Wherever gas-pipes have been laid before the *régime* of the steam-roller, the road authorities use the roller at their own risk; but where pipes are laid since the steam-roller came into use, a gas company must take the risk themselves. Notwithstanding these decisions, the Dublin Company sued the County Council again last year on the question of the depth at which a new main was to be laid. The Company proposed to lay it at a depth of 2 ft. 5 in., but the County Surveyor stipulated for a depth of 3 feet. The County Surveyor, under cross-examination, admitted that if he were the Company's Engineer, he would not hesitate to lay it at a depth of 2 feet, but in the interests of the Council, he stipulated for 3 feet. The decision was that in this particular case, the depth the Company proposed, 2 ft. 5 in., was sufficient.

The result of my own experience is that the depth of the pipe is really of minor importance compared with the manner in which it has been laid and the condition of the ground in which it is laid. If the pipe has been laid on an uneven bed, or in ground partly hard clay or rock and partly soft and spongy, the roller will deal roughly with it. On the other hand, if it has been laid on a good, solid bed, and not undermined in any way, or made excessively rigid in places, no matter what the depth may be, the roller will do it little harm. I have had pipes broken at the depth of 2 ft. 8 in. and 3 feet below the surface, and others uninjured at only 12 inches below the surface.

Given a good pipe, well laid, even with only 6 inches of cover, you might defy the ordinary 10 or 12 ton steam-roller. Of course, for many reasons, we do not want our pipes so near the surface as that, and ought to secure if possible at least 18 inches or 2 feet of cover, and the more especially as the harm is not usually done by the road-roller proper, but by the narrow driving wheels. Our pipes, being usually along the side of the roadway, have to bear their full weight, and are exposed to the extra strain due to skidding.

The fortunes of the electric light seem to be undergoing a change. It has always been spoken of as the light of the future, and has threatened to sweep gas-works plant into the scrap heap. Yet the gas industry has never been in such a healthy and prosperous condition as it is at the present time. On every hand there is progress and extension. The introduction of electricity in any district seems to have the invariable effect of sending up the gas consumption by leaps and bounds. The extended use of gas for cooking, heating, and motive power, and the introduction of the slot-meter, have had a great influence for good on our industry; but there is no doubt the greatest influence has been exerted by the advent of the incandescent burner, with its developments—the self-intensifying and high-pressure systems. These have raised the illuminating power obtainable from gas from about 3 candles per cubic foot to 12 to 15 and even up to 30 candles per cubic foot. So that now no one need have a less value from his gas consumption than 12 candles per cubic foot. And, although electricians still persist in comparing their results with gas consumed in the ordinary—I was about to say old-fashioned—flat-flame burner, yet consumers are comparing them with the incandescent burner, and finding that, by the use of these burners, they can get more light for less money than with electricity.

For street illumination, it has not been the success that one would have expected. The incandescent electric lamp has entirely failed to give satisfaction as an out-door illuminant. Even with a couple of 16-candle power lamps in one lantern, the result is very poor; and it is by no means cheap. Two 16-candle power lamps, absorbing $3\frac{1}{2}$ watts per candle, means that for 32 candle power 112 watts per hour are absorbed, making in (say) ten hours $1\frac{1}{8}$ Board of Trade units, which, at the average public lighting rate of municipal installations—2d. per unit—represents a cost of $2\frac{1}{4}$d. Now, one incandescent gas-burner, consuming $2\frac{1}{2}$ cubic feet per hour, will give a decidedly higher candle power, and in ten hours would consume 25 cubic feet of gas, for which, if the same amount ($2\frac{1}{4}$d.) were allowed, it would be equivalent to gas at 7s. 6d. per 1000 cubic feet.

Again, if we take the arc lamp, which is no doubt a very brilliant and effective outdoor light, its cost is excessive, and it is, as a rule, most unsteady, and can only be rendered steady and reliable by increasing the cost. A reliable authority on electric lighting says that "the actual power of a so-called 2000-candle power arc lamp is equal to that of not more than 875 candles," and, further, "it may be taken that, on an average circuit, the engine indicates 1-horse power for each ordinary, or 875-candle power, lamp." Therefore, for one of those electric arc lamps, three-fourths of a Board of Trade unit is required, which, at 2d. per unit, amounts to $1\frac{1}{2}$d. Now the same illuminating power can be obtained with self-intensifying incandescent gas-burners from a consumption of 30 cubic feet per hour, which, at $1\frac{1}{2}$d., would represent 4s. 2d. per 1000 cubic feet.

Now, as these facts are daily becoming more fully recognized, the result is that many of our large towns are doing away with electricity, and substituting incandescent gas for street lighting. More especially is this the case where both gas-works and electric station belong to the corporation, or where both supplies are in the hands of companies. But it is found even where the corporation own the electric station and have to buy their gas from a company, as in the case of Liverpool, where only 4 miles of streets are lighted by electricity and over 400 miles by gas. I should not omit here to mention the fact—which, on its publication a short time ago, threw the partisans of electric lighting into something like consternation—that out of 76,000 street-lamps in London, 71,000 are lighted by gas; and the recent decision of the Westminster City Council to light the new thoroughfare of Aldwych by gas shows the change that has taken place in the public estimation of the two illuminants.

For indoor lighting, the price charged is always much higher than that with which local authorities debit the public lighting account, and, consequently, the comparison as to cost is very much more appreciable. There is no doubt whatever that for either public or private illumination, electricity cannot compete with gas on the ground of cheapness. Light for light, it is undeniably much more expensive; and if it does, in certain places, have the preference, it is on other grounds. No one can deny that for internal lighting, the incandescent electric lamp has certain decided advantages over gas. It is cleaner, and more convenient in many ways. No matches are required with it. It is easy to turn off or on—though it must be either off or on, there is no leaving it at half-cock. It can neither vitiate nor consume the air of a room. It has no appreciable effect on the temperature of a room, which, however, is sometimes felt to be a disadvantage. It is not affected by draughts, and it does away with those upward currents which deposit dust on ceilings and cornices, and soil the goods on upper shelves in shops; and, of course, if people consider these advantages are worth the extra cost, they have every right to them. But I rather think that it finds its way into many situations because it is considered the correct thing—it is fashionable and up-to-date. Consequently, we find it in the homes of the wealthy, in fashionable hotels, in places of public resort, in municipal buildings, in lunatic asylums, &c.—indeed, wherever economy is not of first importance.

Let me say that it is not the fault of the electricians that the electric light is not cheap. I am sure they are as anxious to cheapen its production as we are to cheapen the manufacture of gas. They cannot help themselves. It is practically impossible to produce it as cheaply as gas—unless, indeed, the power that is to be converted into electrical energy is to be had free. When the source of the power is coal, the question is simply What is the most economical method of transforming the potential energy of the coal into light? If it is converted into electricity by means of steam, it is done at a tremendous loss in every stage of the process, and there are no bye-products. If it is turned into gas, there is comparatively small loss, because of the value of the bye-products.

On this very account, and by reason of the high efficiency of the gas-engine, it would seem that the most economical method of generating electricity is by using gas as the motive power. For large electric stations, the ordinary price of town gas would be more expensive than producer gas, which would doubtless be the cheapest source of power on a really large scale. But for moderate installations, town gas at ordinary prices undoubtedly works out cheaper than steam.

About three years ago, one of the leading merchants in this city installed an electric plant for lighting his establishment (drapery); the motive power being a gas engine, with town gas at 3s. 9d. per 1000 cubic feet. It has given him great satisfaction; and from calculations I have made, based on the results of my own observation and tests of its working, I think you will agree with me that it has been highly successful.

The engine used is a Crossley, N.E type, calculated to give $10\frac{1}{2}$ effective horse power. The dynamo (which, I may say, was not new) is a compound wound dynamo, by Greenhill, of Belfast. There are seventy 16 and two 8 candle power lamps, equalling 71 16-candle power supplied. The voltage is 61, and the current, in ampères, is 61; so that the electrical energy expended is 3721 watts per hour. This works out to an expenditure of 3·26 watts

per candle, which is a remarkably good result. The consumption of gas is 145 cubic feet per hour, which gives 38·97 cubic feet of gas per B.T.U., and is equal to 1¾d. per unit. This ought to be rather less, because it means a consumption of 29 cubic feet of gas per electric horse power, which is high; but I fancy this is due to a low efficiency in the dynamo. I should say that the lamps are supplied direct from the dynamo, there being no storage batteries; and the light is perfectly steady. It may be well to note in passing, however, that while 145 cubic feet of gas develop in these electric lamps 1136-candle power, the same quantity consumed in self-intensifying burners would develop 4350-candle power.

Another installation has just been completed; but at the time of writing this address, it had not been started, so that I have no figures for it. It is for supplying the new cathedral, St. Patrick's College, and Cardinal Logue's residence. It consists of a Crossley gas-engine, R. E. type, calculated to give 23 effective horse power. The dynamo is by the General Electric Company, of London, type E. G. Volts, 160; ampères, 125; speed, 1060. There is a secondary battery of 56 cells. The number of lamps to be supplied is over 500—partly 16 and partly 8 candle power; also a 4-horse power motor for the organ.

Such results as these seem to me to prove pretty conclusively that, at all events for private installations, gas power is the cheapest method of generating electricity. Such an installation in some of our large cities, where gas is cheap and gas-engine supplies may be had, I suppose for half what it can be sold at in places like Armagh (having a small consumption and a very heavy carriage on coal) would cost less than 1d. per unit.

The "Electrical Times" publishes in tabulated form the returns of the various electric supply undertakings in the United Kingdom, and from an examination of those owned by local authorities, London and Provincial, I find that, even in these large concerns, fitted with the most up-to-date appliances, and, I am sure, under the most efficient management, only a very few can approach 1d. per unit as their works costs—the average being 1½d. The average total cost per unit, not allowing for interest on capital or depreciation on plant, is 2d. per unit. The average price at which current is sold to private consumers is 4d. per unit. The companies charge 5d. per unit; but they all make more or less of a profit, which only a few of the local authorities do. The local authorities, as a rule, charge public lighting supply at prime cost before interest or sinking fund are taken into account; and the sums set apart for sinking fund seem very inadequate considering the nature and cost of the plant in which the capital is sunk.

In these returns, I find only two Irish undertakings—Dublin and Belfast; and it may be interesting for you to know the figures for these. The total cost per unit, not allowing for interest or sinking fund, is: Dublin, 3·09d.; Belfast, 1·32d. The price charged per unit to private consumers is: Dublin, 5·72d.; Belfast, 3·19d. The result is that in Dublin, after paying interest and providing 3 per cent. for sinking fund, there is a loss of £5524; and in Belfast, after paying interest and providing 2 per cent. for sinking fund, there is a profit of £2602. The distribution costs, including loss in transmission, must be very great when we consider that the cost of generation is about 1¾d. per unit, and yet it cannot be sold at a profit under about 5d. per unit. The gas undertaking must be labouring under very heavy disabilities that would require to charge any of its customers three times the cost of gas into the holder.

This factor is eliminated, to a large extent, in private installations; so that—say, in large factories—the cost should compare much more favourably with gas than under any other circumstances. There, steam is always required; and the introduction of electric light only means an extension of the plant, with skilled supervision, and the proper allowance for depreciation and interest. Under such circumstances, the cost ought to run much about the same as in a large central supply station; but even then, light for light, the cost must be very much greater than for gas in incandescent burners if it is to be had at any reasonable price. But the actual cost in such places can scarcely be arrived at, as the conditions are generally entirely different before and after the putting down of the electric plant.

I have been tempted to deal at such length with matters electrical, because I have been lately giving the subject a good deal of attention; my Directors having contemplated the erection of an electric supply station, considering that if there were a demand for it, we, with gas at first cost, could meet it as efficiently and economically as any competitor. But when we had gone into the matter, we found that the demand was more apparent than real; so the scheme dropped. However, until electricity can be supplied at less than 1d. per unit, it cannot compete on the score of price with gas at current rates, as with good incandescent burners—not to consider high-power burners at all—it takes 60 Board of Trade units of electricity to give the equivalent in candle power of 1000 cubic feet of gas.

At the risk of quite exhausting your patience, I must still refer to one matter which will call for your consideration to-day—*i.e.*, the subject of the affiliation of the District Associations with the Institution of Gas Engineers. As you know, a conference between representatives of the District Associations and the Special Committee of the Institution was held in London on the 7th of April last, at which I had the honour of representing this Association. The recommendations made by that conference have been adopted by the Institution; and it now remains for the various District Associations to express their willingness to affiliate with the Institution on those terms. Already, all the five District Associations in England have done so. It is for you at this meeting to decide whether you will follow suit. The terms of affiliation are in your hands, and I trust that you may come to a unanimous decision one way or other. There are certain adjustments of the Institution's Articles of Association which must be made before affiliation can be carried out under those terms; but no difficulty is anticipated in this respect.

I confess it is rather difficult all at once to appraise the advantages of affiliation; but I feel certain that we cannot be thus brought into closer contact with the central organization without mutual benefit resulting therefrom. I must say I regret that the conference did not make use of the fifth in the list of suggestions in connection with this subject that this Association submitted to the Council of the Institution—viz., "that, in the event of affiliation, the Institution should secure gentlemen to either read papers or deliver lectures occasionally to such District Associations as desire it. The expenses to be paid by the District Associations." However, as it seems natural that, should affiliation be accomplished, some representative of the Institution would occasionally visit the District Association meetings, this suggestion may yet be acted on, and thus make closer and firmer the bond of union between gas engineers and managers throughout the Three Kingdoms.

THE GAS INDUSTRY IN HOLLAND.

By N. W. van Doesburgh, of Leyden.

[A Paper read at the Annual Meeting of the Dutch Association of Gas Managers.]

From the statistics of the Dutch gas-works for the year 1902 I have compiled some figures, which seemed sufficiently interesting to merit the attention of the members of the Association for a few moments. In these statistics the technical results of 83 gas-works are published almost completely. These works supply gas to about 2,382,000 persons; being about 45 per cent. of the population of Holland. The figures are compiled under five heads: (I.) Averages of 4 gas-works in towns with a population of more than 100,000; (II.) averages of 11 gas-works in towns with a population ranging from 30,000 to 100,000; (III.) averages of 27 gas-works in towns with a population ranging from 10,000 to 30,000; (IV. and V.) averages of gas-works in towns and villages with a population less than 10,000. Under Head IV. are classed 24 gas-works which use an exhauster; under Head V., 17 without exhausting plant.

The following table shows the number of tons of coal for producing gas furnished to the above-mentioned works by Westphalia and by Great Britain during the year 1902:—

Heads.	Westphalian Coals Carbonized.	English Coals Carbonized.	Total Westphalian and English Coals.	Percentage of Westphalian Coals.	Percentage of English Coals.
I. . .	324,583	72,329	396,912	81·8	18·2
II. . .	88,822	68,298	157,120	56·5	43·5
III. . .	53,990	68,817	122,807	44·0	56·0
IV. . .	14,575	18,008	32,583	44·7	55·3
V. . .	4,437	7,687	12,124	36·6	63·4
	486,407	235,139	721,546	67·4	32·6

From this table it will be seen that in the larger gas-works about 80 per cent. of Westphalian and 20 per cent. of English coals were carbonized. The works grouped under Heads II., III., and IV. together distilled about as much Westphalian as English coals; while in the smaller gas-works a great deal more English than Westphalian coal was carbonized. According to the account of the Rheinisch-Westfälischen Kohlen-Syndicat, their collieries in the Ruhr area produced 13,692,883 tons of gas and "flaming" coals in 1902. Of this quantity the Dutch gas-works received 3·55 per cent.

The figures in the following table give for the five groups the production of gas and residuals per ton of coal carbonized:—

Heads.	Gas.	Coke Produced.	Coke for Sale.	Tar.
	Cubic Feet.	Pounds.	Pounds.	Gallons.
I.	5,920	1590	1075	9·95
II.	10,007	1568	1086	9·15
III.	10,136	1523	1021	9·15
IV.	10,007	1456	784	8·56
V.	8,676	1492	694	8·76

From this table it will be seen that it makes little difference in the production of gas per ton of coal carbonized whether or not an exhauster is employed. If one is used, the yield in gas in small or large gas-works is about the same. The production of coke in small works is rather lower than in large ones; but the quantity available for sale is much greater in the latter than in the former. The production of tar is nearly the same for all works. With regard to the yield of ammonia, the figures in the Dutch statistics show too great a difference to allow of an average being struck from them. In the 17 works, 2798 tons of sulphate of ammonia were produced, or 15·66 lbs. per ton of coal.

The total quantity of coal carbonized in 1902 was 721,546 tons.

It yielded as follows: Gas, 7,423,739,000 cubic feet; coke (total), 505,469 tons; do. for sale, 340,199 tons; tar, 6,521,000 gallons. Moreover, in six works water gas was manufactured; the production in five works being 349,440,000 cubic feet of carburetted water gas, and in one works (Arnhem) 19,025,000 cubic feet of "blue" water gas. For the carburetted water gas there were used 6260·6 tons of coke and 928,000 gallons of American and Gallician oil; being 40·13 lbs. of coke and 2·66 gallons of oil per 1000 cubic feet. I must add here that, in addition, 153 tons of cannel were carbonized.

The following table shows the proportion of gas used for different purposes:—

Heads.	Through Ordinary Meters.		Through Prepayment Meters.	Municipal Buildings.	Public Lighting.	On Works.	Unaccounted for.
	(a)	(b)					
I.	70·03	3·17	13·16	2·68	6·89	..	4·07 (c)
II.	66·51	4·70	11·33	1·71	8·97	1·74	5·04
III.	67·47	6·74	5·54	1·18	10·77	1·87	6·43
IV.	66·58	7·55	4·83	0·98	10·56	3·24	6·26
V.	63·10	3·59	4·09	2·05	14·95	4·19	8·03

(a) For lighting, cooking, and heating. (b) For motive power.
(c) Inclusive of gas used on works.

It was impossible to give separately the consumption of gas for illuminating and cooking and heating purposes. From the gas employed for motive power, it may be seen that, excluding the very small towns and villages, the gas-engine is used comparatively more in smaller than in larger towns. The same result is found when we calculate, for the five groups, how many motors are employed per 1000 inhabitants. From the figures showing the consumption of gas for public lighting, it will be seen that this becomes higher as the sizes of the towns decrease. In small towns the unaccounted-for gas is greater than in large ones.

The average prices per 1000 cubic feet charged for gas for lighting, heating, cooking, and motive power in 1902 were as follows: Gas-works under Head I. 3s. 1¾d.; do. under Head II., 2s. 10d.; do. under the Head III., 3s.; do. under Head IV., 3s. 7d.; do. under the Head V., 3s. 9d. In Leyden and Tilburg the gas was sold at 2s. 4d. per 1000 cubic feet; this being the lowest price charged for gas in Holland.

The following table shows the number of cubic feet of gas consumed per inhabitant in 1902:—

Heads.	Private Houses and Municipal Buildings.	Public Lighting.	On Works and Unaccounted for.	Gas Production.
I.	3237	250	147	3634
II.	2967	316	238	3521
III.	2181	290	224	2695
IV.	1903	251	227	2381
V.	1044	214	176	1434

This table gives the average for each of the five groups. If we take a few towns separately, it will be seen that the figures vary a great deal from the averages. For instance, for Utrecht the gas consumed per inhabitant in 1902 amounted to 4845 cubic feet; then follows Arnhem with 4683 cubic feet. For Leyden the figure was 4411 cubic feet. When compared with Brussels, these figures are still low. There the gas consumed in 1902 was as much as 6745 cubic feet per inhabitant. Some towns in the North of England have a still larger consumption—reaching 7000 cubic feet per inhabitant.

In the following table is shown the quantity (in cubic feet) of gas consumed per yard of main:—

Heads.	Private Houses and Municipal Buildings.	Public Lighting.	Unaccounted for.	Number of Gas Meters Placed per 100 Yards of Main.
I.	4032	311	170 (a)	11·62
II.	2495	269	149	8·25
III.	1624	221	142	6·25
IV.	1024	133	71	4·75
V.	850	163	85	4·86

(a) Average for Rotterdam, The Hague, and Utrecht.

The diminution in the figure for unaccounted-for gas is to be explained by the reduction in the number of meters placed per 100 yards of main. The total length of mains of the 83 gas-works is 1450 miles.

Heads.	Number of Meters Placed per 100 Inhabitants (a).	Size of Meter. Number of Lights per Consumer (no Slot Meters).	Consumption per Ordinary Gas-Meter in Cubic Feet.	Consumption per Slot Meter in Cubic Feet.
I.	10·14	9·73	41,575	13,650
II.	10·07	10·61	36,105	13,488
III.	8·51	7·79	27,868	12,029
IV.	8·78	6·41	21,603	13,311
V.	6·18	5·77	17,457	10,998

(a) In this column the ordinary meters in private houses and municipal buildings are grouped together.

The following figures show the proportions of ordinary (O.) and slot (S.) meters placed: Head I.—O., 65; S., 35 (4 works). Head II.—O., 70·6; S., 29·4 (11 works). Head III.—O., 78; S., 22 (16 works). Head IV.—O., 82·9; S., 17·1 (12 works). Head V.—O., 80; S., 20 (7 works). At the close of 1902 there were 163,733 ordinary meters in use in the 83 towns and villages. In 50 of them, 63,816 prepayment meters were employed.

The following table shows, for the five groups, the proportion of the largest production in 24 hours to the annual make of gas, and that of the storage capacity to the maximum daily production:—

—	I.	II.	III.	IV.	V.
Largest production in 24 hours compared with the annual make of gas	Per Cent. 0·44 or 1-227th	Per Cent. 0·44 or 1-227th	Per Cent. 0·47 or 1-213th	Per Cent. 0·48 or 1-208th	Per Cent. 0·50 or 1-200th
Storage capacity compared with the maximum daily production	62·3	73·1	82·8	86·0	61·3

With this table I will close my paper. Before finishing, however, I wish to thank the compilers of the statistics relating to the Dutch gas-works. Anyone who has collated figures, knows how much care and attention has to be given before they are ready for publication. For some years Heeren van der Horst and Bolsius have collated those connected with our gas-works and edited them; and probably many present will have used the material they have prepared. I think I can speak in the name of all in thanking them for their work.

COKE MAKING AS AN INDIAN INDUSTRY.

In the "Times of India" for July 9, it is remarked that one of the most important questions to be determined in connection with the scheme for working the iron deposits in the Central Provinces is the possibility of profitably coking the local supplies of coal. At the present time, owing to the small demand for metallurgical purposes, no more than 300,000 tons of coke are manufactured in India every year; and this is made in kilns, which not only produce an inferior coke, but do not recover any of the bye-products. In a recent issue of the "Records of the Geological Society of India," Mr. T. H. Ward, Assoc.M.Inst.C.E., the officiating Superintendent of the East Indian Railway Company's collieries at Giridih, examines the question whether it will pay to introduce modern methods of coke-making into the coal-field. The modern methods of coke-making are of a twofold character—there is the non-recovery process, where the chemical bye-products run to waste; and the recovery process, where they are extracted and prepared in a marketable form. Taking the non-recovery oven first, Mr. Ward claims that it would produce a greater yield of coke, with less ash, at one-third of the working charges now incurred. The successful working of the recovery process is dependent upon two factors—the proportion of nitrogen in the coal and the price of sulphuric acid in Calcutta. Taking the latter point as favourably settled, and allowing for the recovery of 20 lbs. of sulphate of ammonia per ton—an allowance Mr. Holland, the Director of the Survey, says is reasonable in view of the results of the assays—Mr. Ward shows that "recovery" ovens would prove highly remunerative, notwithstanding the considerable initial outlay. There is a strong demand for sulphate of ammonia as a fertilizer. Java alone imports some 24,000 tons a year, chiefly for the sugar plantations; and there is not the slightest doubt that the whole output from Indian coke-ovens would be easily sold at highly remunerative prices. The profits on the tar extracted would also, Mr. Ward thinks, be much greater than in England, because the whole of the tar and pitch used in India has to be imported.

Affairs of the Rio de Janeiro Gas Company.—It would seem from the following translation of a paragraph which appeared in "La Belgique Financière" on the 10th inst., that the affairs of the above-named Company are not in an altogether satisfactory condition: "A very real unrest is beginning to manifest itself anew among those who are interested in this concern. Nearly three months have passed since there were added to the Board two new Directors, in whom rested, and still rest, considerable hopes. M. Brison, who is eminently fitted for such a mission, should have set out immediately for Rio de Janeiro to take in hand the work of reform so indispensable. But he is still in Brussels, and since the rumours of the last general meeting have reached Brazil, as was to be expected, the already unfortunate situation has become worse. The Manager there has resigned, and the concern is now dependent upon local influences, which up till now can scarcely be said to have been exercised in the interests of the Company. Frankly speaking, everybody is anxious to know what has passed behind the scenes in the Council. One cannot, and does not wish to, believe that personal interests altogether foreign to the Company are holding in suspense measures so urgently required in the general interest. Only one fears such is the case; and that is already much—too much."

TESTS OF GAS COALS AT THE BERLIN MUNICIPAL GAS-WORKS.

Reference has already been made in the "JOURNAL" (Vol. LXXXVI., p. 943), in the course of the report of the proceedings at this year's meeting of the German Association of Gas and Water Engineers at Hanover, to the communication on gas coals which Professor Drehschmidt presented at that meeting. Having regard to the facilities for carrying out an exhaustive series of tests of a large number of different gas coals, which, as Chemist to the Municipal Gas-Works of Berlin, Professor Drehschmidt had at his disposal, and to the care with which his investigations have been made, the following more detailed summary of his communication has been prepared. The illustration is reproduced from the "Journal für Gasbeleuchtung."

Endeavours have repeatedly been made to take the chemical composition of coals as a basis for their classification, and to draw conclusions therefrom as to the qualities which are of importance in regard to the practical applications of the coals. At first, it was supposed that the hydrogen in the coal, especially the so-called available hydrogen, and its proportion relatively to the carbon in the coal-substance, were the most significant factors. By "available hydrogen" is meant that which remains when the quantity required to form water with the oxygen in the coal is deducted from the total amount of hydrogen present—that is to say, it is the total hydrogen, less one-eighth of the weight of oxygen. But the exceptions to such a generalization proved so numerous that it could no longer be accepted as useful. The total proportion of hydrogen in coal fluctuated within quite narrow limits; while there were far greater differences in the proportion of oxygen present. For instance, with 68 varieties of gas coals examined at the Berlin Gas-Works, the difference in the hydrogen found was at most about 1½ per cent.; while in the oxygen there was a difference of 10 per cent. Lately, therefore, the predominating influence on the qualities and behaviour of coals has been ascribed to the oxygen, especially in regard to the use of the coal for gas making.

M. St. Claire Deville has arranged coals in five classes, according to the amount of oxygen they contain, in accordance with the results of researches which he has made at La Villette (Paris) Experimental Gas-Works. As the proportion of oxygen in the coal increased, he found that, on carbonization, the yield of coke fell, and the total make of volatile products—viz., gas, tar, and ammoniacal liquor—increased, though the volume of gas became smaller. But this was not a rule without exception. For example, the Berlin tests show that one coal, containing 6·34 per cent. of oxygen (= 6·97 per cent. of the coal-substance) yielded 10,528 cubic feet of gas per ton of coal, or 11,816 feet per ton of coal-substance; while another coal, containing 9·70 per cent. of oxygen (= 10·91 per cent. of the coal-substance), yielded 12,068 cubic feet of gas per ton of coal, or 13,847 feet per ton of coal-substance. Such examples might be multiplied. It must, however, be admitted that M. St. Claire Deville's rule frequently proves correct; for the oxygen, with the hydrogen—particularly the available hydrogen—forms the volatile portion of the coal-substance, and thus the total quantity of volatile products of the coal, comprising gas, tar, and liquor, increases with the proportion of oxygen in the coal. The rule, however, is not wholly trustworthy, and especially leaves the gas manager in the lurch in regard to the matters which most concern him—viz., the yield and quality of the gas.

The carbonization of a small sample of the coal in a platinum crucible, as recommended by Muck, will enable an opinion to be formed as to its probable fitness for gas making; but this cannot thus be predicated with certainty. Reliable judgment as to the gas-making qualities of a coal can only be formed from its practical carbonization. This is not a matter for surprise, when it is remembered that coal probably consists of a very large number of compounds, of which the composition and molecular size differ, and are, and are likely to remain, unknown. It is known that organic bodies, having the same percentage composition, and even belonging to the same class and of the same molecular size, behave very differently from one another when heated. Muck states that cellulose and starch, both of which have the formula $C_6H_{10}O_5$, and belong to the class of carbohydrates, and probably have the same molecular size, when heated in a platinum crucible from which air is excluded yield a different amount of residual coke; the quantity being 6·71 per cent. with cellulose, and 11·30 per cent., or nearly double, with starch.

Chemical examination of coal is, however, of some value; it will serve to identify a consignment, or to determine the proportion of ash, which greatly affects the value of the coke. Further, it may thus be determined approximately how much sulphur will be volatilized on gasification, and to what extent the oxide purifiers will be thereby taxed. But the main questions, as to how much and what gas a coal yields and the quantity and quality of the bye-products, cannot be answered by the aid of chemical examination, but only by carbonization under the conditions which prevail on gas-works.

Of late years, the question of coal testing has been often to the fore at the Berlin Municipal Gas-Works. Many English coals were offered at lower prices than the German coals hitherto used, and a greater variety of German coals came into the market. To test all the kinds on the full working scale of the gas-works was not feasible, and would have caused inconvenience and loss. It was therefore determined to erect an experimental plant. Such plant is frequently made on a small scale, so that it may be contained in the laboratory itself. But clearly quite different conditions prevail with such a plant to those of plant on a working scale. The retort is only large enough to take a charge of 1 to 2¼ lbs. of coal, and is of cast iron, which will not withstand the high temperatures now prevalent in gas-works' retort-settings. But the size of the charge and the temperature of carbonization exercise a very marked influence on the course and results of gasification. For instance, among the tabulated results of trials of coals at the Berlin works are those of one description of English coal, which, with a charge of 309 lbs., worked off in five hours at a temperature of 1150° C., yielded 11,705 cubic feet of gas per ton, and with a charge of 331 lbs., worked off in six hours at a temperature of 1125° C., yielded only 10,400 cubic feet per ton. Obviously, therefore, a small-scale plant would give quite different results from one on a large scale.

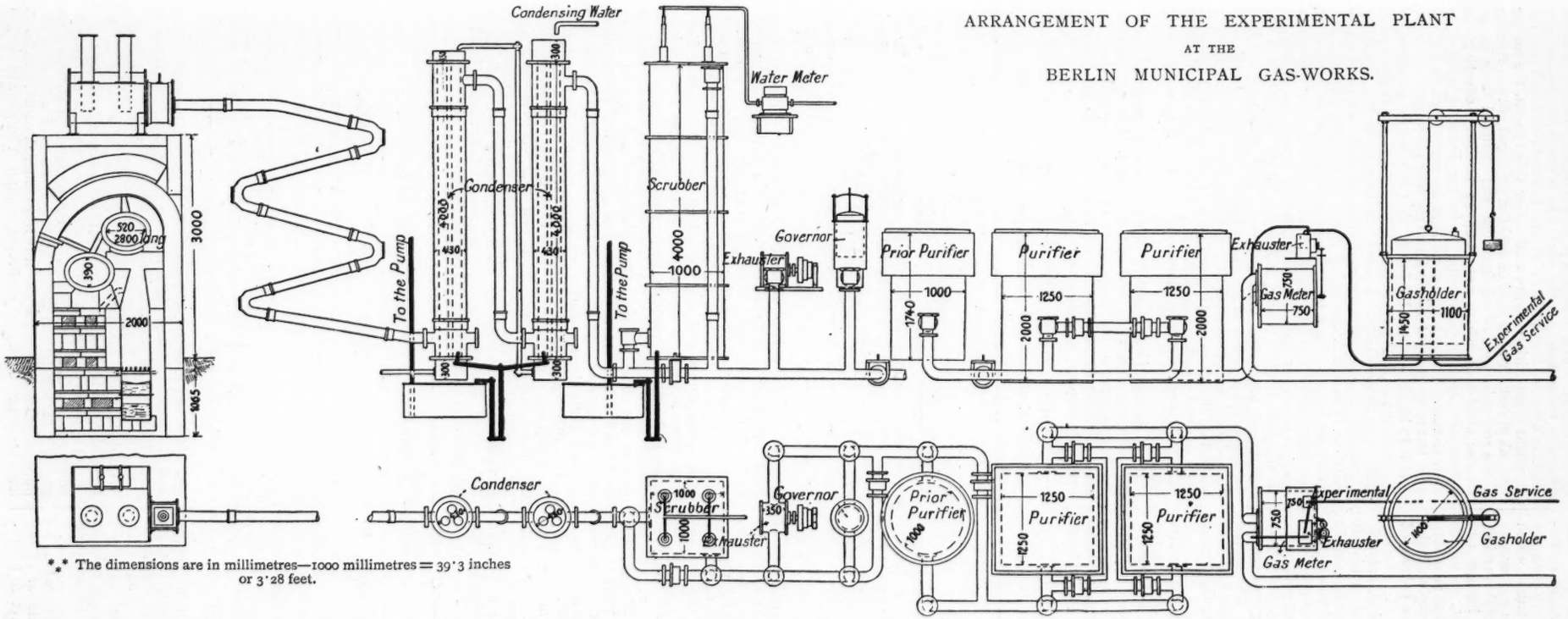
It has been said that such miniature gas plant admits of the value of a description of coal being determined by reference to the product of the yield and illuminating power, and that such product is constant for a particular description of coal. But the author thinks such a valuation of little worth; and he doubts the product in question being a constant. For instance, with the example just quoted, the "candles per ton" under the first-named conditions of carbonization were 31,402; but under the second only 29,792. At the same time a change took place in the quantities of the bye-products produced; the amounts of tar, liquor, and coke being 4·2, 10·6, and 67·2 per cent. respectively under the first conditions, and 5·2, 14·7, and 65·6 per cent. under the second. The author considers that when the conditions of carbonization are altered, the whole of the volatile products are affected in regard to their quantity, nature, and action one upon another. The phenomena are of a highly involved character; and their course does not always run evenly in a predeterminable sense.

The experimental laboratory gas plant may therefore give rise to quite considerable errors, and its results will become more trustworthy only as it approaches the full-size gas plant. There are many divergent opinions as to what constitutes a satisfactory experimental coal-testing plant on the working scale. Some think a setting with one or two full sized retorts is adequate; while others consider that at least a large setting with several retorts must be used in order to obtain results comparable with those of a works. But neither one nor the other will attain this end, because the working of the experimental setting will in any case be more carefully supervised. Irregularities in the working of the works' plant are unavoidable; and, consequently, a properly operated experimental setting should always give more favourable results than the works' settings, for which, however, the experimental results afford an ideal to aim at. Since, therefore, entire concordance of the results is unattainable, the experimental plant should be as small as is consistent with proper working.

With a setting having a number of retorts, and still more with several settings, it becomes difficult to maintain the retorts at a uniform heat, or to alter the heat according to the nature of the coal under examination. Moreover, a large quantity of coal would be required for testing, and the whole of the retorts cannot be charged simultaneously, so that it becomes impossible to follow precisely the course of carbonization hour by hour. These considerations determined the Berlin Gas-Works to erect an experimental plant with one setting of only two retorts, each 9 ft. 2 in. by 20½ in. by 15½ in. It was realized that the favourable results which such a setting should afford would serve as an ideal to be aimed at on the works. The results should be independent of all the chances and irregularities of full-scale working, and should serve to indicate changes and improvements which ought to be adopted in the latter. That these expectations were well founded is apparent from the fact that in 1902 the yield of gas per ton of coal carbonized at the Berlin works rose to 11,490 cubic feet from 10,952 cubic feet in 1901, when there was no experimental plant for studying the coals used.

The experimental plant, as erected at the gas-works in the Müllerstrasse, Berlin, is shown in the annexed figure, in which the containing building has been omitted for the sake of clearness. It comprises one setting, with semi-producer firing, of two fire-clay retorts. The gas passes from the hydraulic main on top of the setting through the pipe, which serves the purpose of an atmospheric condenser, to the two water condensers, each of which contains three water-cooled tubes. Thence the gas passes to the rectangular scrubber, furnished with grids and Zschocke's sprinkling apparatus. A Beale's gas-exhauster, with governor, is connected with the scrubber, and is driven by a gas-engine. The prior purifying vessel is charged with breeze and sawdust, with the object of removing tarry matter still present in the gas; and then follow the two purifiers, connected in series, charged with oxide. The purified gas is measured by a meter, and then passes away into the works' main leading to the condensers. A portion of the gas is, however, withdrawn from the outlet of the meter into a gasholder for experimental purposes. This is effected by the exhausting action of a small experimental gas-meter, the shaft of which is coupled with that of the large meter; so that the gas passed into the experimental holder is proportional to the production, and is therefore an average sample of the make. The experimental plant

ARRANGEMENT OF THE EXPERIMENTAL PLANT
AT THE
BERLIN MUNICIPAL GAS-WORKS.



*** The dimensions are in millimetres—1000 millimetres = 39·3 inches or 3·28 feet.

is thus precisely similar to the works' plant, except in respect of capacity. It has, however, been found unnecessary to put the exhauster in action, as the negative pressure in the works' main into which the gas from the experimental plant was discharged afforded the requisite vacuum. As a consequence of this mode of working, however, there was a higher pressure by ½-inch or so in the experimental retorts than is usual; but the author is of opinion that this rather higher pressure has no appreciable influence on gasfication.

A Le Chatelier pyrometer was inserted midway between the two retorts in the setting, adapted for giving automatically a continuous record of temperature. An Ados apparatus similarly provided automatically continuous control of the composition of the spent furnace gases, thereby affording a check on the furnace attendants. The water supplied to the scrubber was measured through a positive meter; so that by deducting the quantity thus registered, the actual volume of gas liquor yielded by the coal could be ascertained. The liquor from the scrubber was collected in one tank, and the condensation products from the anterior apparatus in another. After standing, the tar and gas liquor were weighed separately at definite intervals, and samples taken for examination.

The experimental plant was intended for testing both coal offered for purchase, and that delivered to the works. The testing falls into two principal divisions; the first being carbonization and the determination of the most favourable conditions therefor, the second comprising the chemical and physical examination of the raw material and of the products of carbonization. The mode of working in regard to carbonization was as follows: The setting was heated to a high or low temperature, according to the origin of the coal to be examined, and the two retorts were then charged simultaneously. The charges, amounting to 309 or 331 lbs. per retort, had been previously weighed in the charging scoops. As fresh coals are more or less damp, and it was important to be independent of irregularities, in order to obtain strictly comparable results, the coal had previously been spread out in thin layers in a covered space, until the proportion of moisture had fallen to 2 per cent. on the average.

Observation of the rate of gas production each hour, and especially in the last hour, and of the phenomena when the retort was opened, showed whether the charge had been completely worked off in a given time. If it was not completely worked off, as was usually the case at the first trial, then alterations were made, according to circumstances, either in the heat, the weight of the charge, or the time for working off, until the most favourable carbonizing result had been secured. These three chief factors in determining the results of carbonization had also frequently to be varied, especially with English coals, in consequence of the occurrence of thick tar in the ascension pipes and hydraulic main. When the most suitable conditions had been ascertained by such preliminary trials, carbonization was pursued under them for at least three or four days, and the mean result from these days was recorded. Irregularities, especially in the heat of the setting, were sometimes unavoidable in the trials; and those so affected were disregarded in the calculations. The fluctuations in the temperature noted under ordinary carbonizing conditions amounted to from 36° to 54° Fahr. Hourly readings were taken of the pyrometer, thermometer, water meter, pressure gauge, and gas-meter.

The coke drawn from the retorts was spread out on the retort-house floor, lightly quenched, and left till the following day, when it was picked up with a screening shovel, so as to separate it into large coke and breeze, which were both weighed. Samples of the coal and coke were taken each day, and reserved for chemical examination. The crude gas at the outlet of the prior purifier was tested from time to time for cyanogen; but no testings of

the gas for ammonia were required, as the total quantity produced was ascertained from the tests of the gas liquor. A determination of the amount of sulphuretted hydrogen in the crude gas would have been desirable, as a criterion of the extent to which oxide would be fouled by the different coals; but the author was not aware of any simple continuous method for its determination, though he has lately elaborated one, of which he hopes to publish the account shortly. Information, however, as to the amount of sulphuretted hydrogen in the crude gas was in reality afforded by the determinations of the proportion of sulphur in the coal and in the coke obtained from it. It could be calculated how much sulphur was gasified.

The purified gas was tested for illuminating value, calorific power, specific gravity, and the amount of carbonic acid and sulphur in it. Special importance attaches to the determinations of the sulphur in the gas. Many English coals yield gas so rich in organic sulphur compounds that they could not be used alone, but only together with other coals not having this objectionable quality, in Germany where purification only by oxide, and not by lime also as in England, is customary. This is a pity, because such coals frequently afford very rich and good gas. The nature of the coke, its appearance, size, hardness, and yield of ash, were likewise taken into consideration when judging the fitness of a coal.

A tabulated statement has been prepared showing the results of the greater part of the tests made in over three years in the experimental plant. The tests recorded relate to 68 different kinds of coal; 37 being English, 9 Westphalian, and the remaining 22 Silesian. The basis of classification adopted by the author is the proportion of oxygen in the coal-substance or ash-free coal. The organic coal-substance is responsible for the products of carbonization; while the ash is merely a highly variable and undesirable constituent of the coal, which tends to obscure any relation between the quantity of the products obtained and the chemical composition of the coal. For this reason, the author has calculated for each kind of coal the principal data in relation to the coal-substance or ash-free coal, and included them in the tabular statement, which comprises 44 headings, covering the information already mentioned as having been ascertained in each testing. The results cannot here be reproduced in full detail; but some general conclusions may fitly be given.

It is to be observed at the outset that the figures obtained for the products of carbonization, and the yield of gas in particular, differ from those which have previously been published by others. The earlier tests, however, were conducted from a different standpoint, as then the illuminating power of the gas was the predominant factor. Since incandescent gas lighting has superseded the older methods of lighting with flat-flame and argand burners, stress is no longer laid on the illuminating power, but instead on an adequate calorific power, of the gas, for the protection of the consumers' interests. Most gas-works have gradually reduced the illuminating power of the gas supplied by them. In the testings of coal now reported, the coal has been more completely worked off than was formerly customary; while descriptions have been selected which afford a large quantity of gas of adequate calorific power, though its illuminating power may not be very high.

It will be seen from Table I., which shows the range of variation of composition of the coals examined, that the greatest differences occur in the proportions of carbon, oxygen, and ash present; while the differences are relatively small in regard to hydrogen, sulphur, and nitrogen.

TABLE I.—*Composition of Coals, in Percentages by Weight of the entire Coal and of the Coal-Substance (Ash-Free Coal).*

—	English.		Westphalian.		Silesian.	
	Coal.	Coal-Substance.	Coal.	Coal-Substance.	Coal.	Coal-Substance.
Carbon	63·12—79·33	75·32—86·21	68·24—74·18	81·19—84·63	59·22—79·69	75·27—86·22
Oxygen	5·00—14·84	5·53—17·16	6·62— 8·97	7·61—10·48	5·58—12·60	6·29—15·63
Ash	4·15—20·82	..	9·17—18·11	..	4·99—21·32	..
Hydrogen	2·90— 5·53	3·18— 5·88	3·54— 4·48	4·30— 5·03	3·21— 5·74	3·54— 5·94
Sulphur	0·89— 3·11	0·97— 3·93	0·59— 2·48	0·69— 2·73	0·74— 2·20	0·78— 2·79
Nitrogen	1·00— 1·77	1·10— 1·94	1·26— 1·59	1·42— 1·85	0·81— 1·50	1·02— 1·76

Generally speaking, it will be found that the percentage of carbon falls as the percentage of oxygen rises, as does also the coke remaining when the coal is ignited in a crucible. The rule, however, is not always exact, and it is probable that the proportion of available hydrogen has some influence. The proportion of ash in gas coals is far higher than formerly, and now reaches as much as 20 per cent. The yield of gas and the value of the coke are thereby much diminished. The amount of ash is highest as a rule with Westphalian and English coals. Were it possible to win the coals free from ash, German, and Westphalian coals in particular, would surpass the English in respect of yield of gas. In regard to the hydrogen, nitrogen, and sulphur in the coals, no rules as to their amount can be deduced, as was possible to a certain extent with reference to the carbon and oxygen.

There is a striking difference between the coals, in regard to carbonization, according to their origin. The English coals could only be carbonized at tolerably low temperatures if severe tar stoppages of the ascension pipes and hydraulic main were to be avoided. In order to ensure complete carbonization with English coals, the charge per retort must not exceed a certain weight; and the period allowed for working it off must be at least five hours. Westphalian coals also require this period; but both the heats and the weight of charge may be increased, and the capacity of the setting thereby improved. Silesian coals give the least difficulty in carbonization; they will bear a very high temperature, and are worked off in a short time. Even with them, however, a higher yield of gas may be secured by a more prolonged carbonizing time—say, of five hours. Several trials demonstrated that it was not possible with various kinds of coal to cut short the time for working off in favour of higher heats and retain the same make of gas; while, on the other hand, a more prolonged period for working off could not take the place of higher temperatures.

The quantity of products of carbonization varies as much as the composition of the coals; and while there is a tendency for the quantity of liquid products as well as of gas to increase with the amount of oxygen in the coal, there are many instances of exceptions to this tendency, so that it cannot be regarded as a law. The following table shows the range of variation of yield of the products of carbonization in the trials:—

TABLE II.—*Yield of Products of Carbonization in Relation to the entire Coal and to the Coal-Substance (Ash-Free Coal).*

—	English.		Westphalian.		Silesian.	
	Coal.	Coal-Substance.	Coal.	Coal-Substance.	Coal.	Coal-Substance.
Gas per ton, cubic feet	10,144—12,667	11,816—14,228	11,504—12,574	13,410—14,932	10,005—12,369	12,635—14,382
Tar, per cent.	4·2— 6·8	5·2— 8·0	3·4— 5·7	4·2— 6·6	2·8— 8·2	3·2— 9·0
Liquor, ,, ,,	3·6—13·3	2·3—13·3	5·0— 7·4	4·2— 6·6	4·2—11·9	2·5—12·8
Coke, ,, ,,	64·0—78·1	59·9—75·7	67·7—73·9	63·7—70·9	65·0—79·2	58·7—78·0

The figures given in Table II. are taken only from the results of what may be termed normal testings, and not from testings made primarily to ascertain the influence of heats and weights of charges. In calculating the percentage of gas liquor on the coal-substance, the 2 per cent. of moisture in the coal has been deducted. The gas obtained had generally an adequate calorific power, though compared with earlier results the illuminating power might be considered low.

The behaviour of the sulphur and nitrogen in the coal on its carbonization was also interesting. The volatile sulphur in the coal, which corresponds with the quantity of sulphuretted hydrogen which will have to be removed from the gas by purification, and the organic sulphur which remains in the gas, were found to range between the amounts stated in Table III.

On the average, English coals yield more volatile sulphur than Westphalian and Silesian, and the amount of sulphur in the purified gas is highest with English coals—so much so that many of them cannot be used under German conditions, or can only be employed to add to other coals. Only two kinds of Silesian coal, supplied for special purposes, yielded amounts of sulphur in the purified gas similar to the quantity from English coals; and apart from these two kinds, the maximum amount of sulphur in the gas

TABLE III.—*Sulphur in Coal.*

—	Percentage of Volatile Sulphur in the Coal.	Organic Sulphur. Grains per 100 Cubic Feet of Oxide-Purified Gas.
English coals . . .	0·09—1·68	10·2—75·5
Westphalian coals . .	0·18—1·33	10·4—39·1
Silesian coals . . .	0·22—1·22	8·6—75·2

from Silesian coals was about 29·7 grains per 100 cubic feet. The sulphur shows a certain regularity in that the more there is in the coal, the more is gasified as a general rule, and the higher is the amount in the purified gas, though the absolute quantities are different according to the origin of the coal.

In regard to nitrogen, there is no settled dependence of the quantities of cyanogen and ammonia produced on the amount of nitrogen in the coal. Coal containing less nitrogen than another may yield more ammonia and cyanogen than the latter. In general, though not always, there are more ammonia and less cyanogen produced the more water there is formed by the distillation of the coal. Table IV. shows the range of variation of the yields of ammonia and cyanogen.

TABLE IV.—*Nitrogen in the Gas as Cyanogen and Ammonia, expressed in Percentages of the Weight of Coal Carbonized.*

—	Cyanogen.	Ammonia.
English coals . . .	0·041—0·098	0·176—0·364
Westphalian coals . .	0·063—0·098	0·204—0·290
Silesian coals . . .	0·031—0·067	0·146—0·317

The yield of both cyanogen and ammonia corresponds to only from 13 to 27 per cent. of the total amount of nitrogen in the coal—as a rule, to from 15 to 18 per cent.

A general review of the tabulated results of the Berlin testings has led the author to the conclusions that there are very great differences in behaviour with the various kinds of coal, and that mere chemical examination of the coal furnishes a very untrustworthy guide as to its value for gas making. An experimental gas plant is alone capable of answering questions as to how the coal will behave when carbonized on the large scale on a gas-works. Only a few of the larger gas-works (in Germany), however, possess such an experimental plant. All the others are dependent on outside information as to the value of unfamiliar kinds of coal; and such information of a trustworthy character is seldom obtainable. On this account, therefore, the scheme for the establishment of an experimental gas-works, which is being brought forward by the German Association of Gas and Water Engineers, should be very welcome.

THE GERMAN ELECTROLYSIS COMMISSION.

In accordance with the programme drawn up in June, 1903, at the Zürich meeting of the German Society of Gas and Water Engineers, the work carried out during the past year by the Electrolysis Commission appointed by that body falls into two parts: (1) A collection and study of the phenomena of corrosion and damage to water and gas mains which have hitherto been noticed; and (2) the institution of special experiments to ascertain in what fashion such corrosion may be best prevented for the future. With the former object in view, a set of questions was prepared by Dr. Bunte, and distributed among the local authorities, or the proprietors of gas or water mains, in German towns possessing electric tramway systems, the replies which were received being tabulated, condensed, and reviewed by Professor Teichmüller; while for the latter purpose, Herr Max Spindler was instructed to make numerous electrical measurements in the town of Elberfeld. The documents now published therefore comprise the lengthy table of detailed questions and answers, certain explanatory notes upon it, Teichmüller's report and summary of the lessons to be learnt, an abstract account of Spindler's experiments, the formal report of the Commission itself, and, finally, a draft of the precautions which it is suggested should be taken to protect gas and water mains from destruction when the pipes lie near to a system of electric tramways where the rails are employed for the return of the (direct) current of electricity to the power station.

CORROSION IN THE PAST.

From the report of the Commission, it appears that inquiries were addressed to 152 local authorities, water, or gas concerns, and that 131 answers, relating to 117 towns, were received. In four of these towns electric trams do not exist, five others are apparently omitted from the Commission's summary, and so the figures that follow are based on the data supplied by 108 different places. In 63 of these towns (58·5 per cent.), the current is said to be returned to the generating station through the rails only; in 35 (32·5 per cent.), it is returned partly through the rails and partly through insulated cables; in seven (6·5 per cent.), it is returned partly through the rails and partly through bare cables; and in three towns the information given on this point is not explicit. In many cases the return cable is simply a connection between that point of the tramway system which lies nearest the generating station and the negative pole of the dynamo; so that the current flows back principally through the rails. With a few exceptions, however, the use of the rails as the sole return conductors is limited to the smaller towns—in nearly all the large places one or more return cables are employed.

So far as can be ascertained from the replies, the diameters of the return leads employed range in size from 50 to 100 per cent. of the outward cables. In 95 towns it is denied that any electrolytic trouble has arisen; in 13—*i.e.*, 12 per cent.—the contrary is the case. These 13 include two places with no return cables, one place with bare returns, one place with some bare and some insulated returns, eight places with insulated returns, and one place where the conditions are unknown. In three towns either the gas or the water company has found electrolysis to occur, while the other has not observed it; and in several other towns which have answered this question in the negative, a special examination of the mains has shown that some destruction has taken place. Thus it is evident that injury is much more common than is generally supposed, although it has not yet proceeded far enough to become conspicuous by leakage of gas or escape of water. The figures given by Professor Teichmüller do not agree absolutely with those quoted above. He finds that electrolytic action has been noticed in 15 out of 113 towns—*i.e.*, in 13·3 per cent. of the places interrogated. Injurious effects are said to have occurred on 48 different occasions; 19 of them being in Dresden—a town provided with bare return cables. From his examination of the answers, however, Professor Teichmüller prefers to give as actual instances of injury the figure 44, *plus* an unknown number in Hamburg and in Erfurt.

PROFESSOR TEICHMÜLLER'S REPORT.

Professor Teichmüller is of opinion that sufficient interest in the possible effect of stray earth currents has not yet been aroused to render any of these figures representative; for in many towns injury to the mains has only been discovered when they have been opened up for the purpose of answering the questions or for other reasons. Even when electrical measurements have been made, the conclusions drawn from them are frequently erroneous. For instance, in one town it has been urged that there can be no danger because only 5 or 6 per cent. of the current returns by the rails. But such an amount of current as this is quite able to do damage in a short time if it escapes from the mains locally—*i.e.*, at a high current-density. Again, it has been argued that the difference of potential between the rails and the mains is too small to permit of electrolytic attack. But this is a mistake. Brunswick is one of the towns taking this view; the difference of potential being returned as from 0·2 to 1·5 volts, or 4 volts near the generating station. At Erfurt, where the corresponding values are from 0·1 to 3·2—*i.e.*, are distinctly lower than those in Brunswick—serious corrosion has already been noticed.

At Strassburg, one of the towns mentioned by the Commission itself, the Gas Company have found the difference of potential between rails and pipes to be from 0·2 to 1 volt, and, concluding that there was no danger, have not paid particular attention to their mains; but the Water Company have experienced considerable injury. Conversely, at Hanover, the Water Company have become convinced that there could be no danger, and have not observed any cases of attack; but the gas-works have had two. At Magdeburg, there are seven insulated return cables taking the current from the rails, corresponding with seven leads taking the current to the trolley wires. At normal loads, each pair of cables should carry equal current, the greatest difference being 30 per cent.—70 ampères in the positive conductors, as against 100 ampères in the negative ones. Special measurements, however, have shown that the outward cables are nearly always carrying about twice as much current as the returns; and nothing is said as to what has become of the other half. In two towns, pipes which had already been destroyed have been replaced by new ones insulated with a covering of wood or the like. This plan is known to be useless in the United States; and German experience points in the same direction—in one case slight electrolytic action has already been observed on the insulated main. According to some recent information, certain very carefully insulated pipes tried in Hamburg have proved satisfactory; but the value of this evidence is discounted by the fact that insulated return cables were attached to the tram rails about the same time. The answers to the questions show very clearly that return cables protect the gas and water mains to a very considerable degree; while their efficiency is greatly enhanced if (as is done in Hamburg) their electrical conductivity is under control. Apparently only a few towns possess a properly designed system of return cables. The plan adopted in three places, of connecting the tram rails with the bare middle conductor of the 3-wire electric lighting circuits, is of no use; but it is one to which the consumers of current should take exception rather than the gas and water engineers.

The replies do not show definitely whether any particular natural constituent of the ground is likely to affect the extent of electrolytic action. Whenever the position of the injury is mentioned, it has, with one exception, been said to be close to the rails, to the places where rails and mains cross, or to the

points on the tram system. Thus it would appear that the most destructive substance in the ground is the common salt used by the tramway companies for thawing purposes. Strassburg, however, reports one instance of a pipe being destroyed at a distance of 7 metres from the rails. In general the maximum of harm is done in the neighbourhood of the generating station. The replies do not show how the different metals of which pipes, &c., are constructed tend to resist electrolytic action. Cases are given of the destruction of cast and wrought iron, bronze, and lead. Neither is it proved clearly whether water-mains are more endangered than gas-pipes.

Dr. Teichmüller sums up the results of his study of the answers submitted to him in the following way: The number of towns in which gas or water mains have been proved to be destroyed by stray electric currents from tramway systems is admittedly not very great; but it must be remembered, first, that the inquiry has not been pushed very far, and, secondly, that not much attention has hitherto been bestowed by the owners of such mains upon the possibility of attack. It is possible, too, that the tram systems have not yet been in operation for a sufficient length of time to show how much damage they are likely to do in the future; and it is conceivable that the cases of injury reported comprise only those where the corrosion has proceeded so rapidly that the pipes have already been eaten completely through. There can be no doubt that stray electric currents are constantly to be found in all towns having electric tramway systems; that they flow in the gas and water mains; and, which is worse, that they escape from these mains.

The question is not whether these currents exist in the mains, and whether they are capable of attacking the metals, but to what extent they corrode the pipes, and to what degree they shorten the natural lifetime of those pipes. Much more information than we possess at present is needed before such questions can be answered; investigations and measurements must be made on the spot rather than in laboratories; the behaviour of stray earth currents must be studied at large; greater interest in the matter of electrolysis must be aroused among the owners of gas and water mains; and the knowledge which has already been acquired of methods for controlling these earth currents must be made more generally available.

Before passing to the second portion of their inquiry, the members of the Commission draw special attention to a set of figures handed them from Munich, which demonstrate how the difference in potential between certain points of a particular gas-main varies according to the amount of current being delivered to the tram wires from the generating station. The figures in the second column of the table reproduced herewith indicate the maximum amperage of the current supplied at the times mentioned in the first column, while those in the third column record the difference in voltage of two points, 54 metres apart, of a main lying alongside the tramway system.

Time.	Amperes (Maximum).	Difference in Voltage.
8.30 p.m.	1600	+ 0·0050
9	1100	+ 0·0035
9.30	1200	+ 0·0032
10	1000	+ 0·0029
11	900	+ 0·0028
11.30	800	+ 0·0022
12 Midnight	100	+ 0·0005
12.20 a.m.	0	− 0·0007
12.30	0	− 0·0007
5.30	400	+ 0·0027
6	800	+ 0·0038
6.30	1200	+ 0·0035
7	1800	+ 0·0067

It will be seen that the difference in potential between the two given points of the gas-main decreases as the amount of current supplied to the tramway diminishes, and that when the trams cease running, the difference in potential, though much smaller, is in the opposite direction to what it was before. A measurement of the quantity of current flowing along the gas-main could not be made with accuracy; but judging from the diameter of that main, &c., it is probably about 30 amperes. Tests made simultaneously from two points in the tramway immediately over those in the gas-main yield exactly similar results; but the differences in potential are about eight times greater.

The Experiments at Elberfeld.

As previously mentioned, the special experiments instituted by the Commission were carried out by Herr Spindler at Elberfeld. This particular town was selected because the gas and water supplies, and a large portion of the electric tramway system, belong to the Municipality, the authorities of which very kindly gave every assistance towards the measurements and the investigation. Moreover, in connection with its electric lighting circuits, the town of Elberfeld possesses an extended system of testing wires, which enabled accurate measurements to be made of the difference in potential between the tram rails and the minus pole of the dynamos, and also between the rails and a good earth in the generating station. The preliminary experiments have shown that the conductivity of any length of main varies so largely according to the caulking and to the extent of the metallic contact in the sockets, that even rough average figures for the conductivity of such mains cannot be given usefully. They also indicate that hydrants form the only places at which connections may be made with the mains for the purpose of ascertaining differences of potential—domestic stopcocks should not be employed. When, however, quantities of current flowing through the mains have to be measured, connections must be made to the pipes themselves. In certain districts the mains may stand at a higher potential than the tram-rails. In such places, current may leave the pipes for the earth or for the rails.

Among the phenomena observed at Elberfeld, the following are interesting. The mean difference of potential between two points of the tram-rails is 3·5 to 4 volts. The largest current flowing in the mains is 3 amperes. Even in situations where the mains are negative to the rails, current may leave those mains, passing either into the ground, or into other mains. Whenever pipes cross one another, some flow of current occurs, for slight differences of potential nearly always exist. An issue of current from the mains is to be noticed over a large area, reaching its maximum at the spot where the return conductor nearest the generating station is attached to the rails. Ordinary return conductors do not bring about equal electrical conditions in the tram-rails at all the points where the connections are, because the resistances of those conductors cannot be adjusted to suit the currents which have to be removed. When the return cables are fitted with adjustable resistances, an improvement becomes noticeable immediately. By constantly increasing the number of return cables, the difference of potential in the rails may be diminished until it arrives at a satisfactory figure.

A certain gas-main lying near the rails, and not far from the spot of maximum escape of current mentioned above, was found to be severely oxidized over its whole circumference, the oxide penetrating for a distance of 2 or more centimetres into the surrounding earth, and the metal of the pipe being superficially converted into a soft graphite-like mass. Evidence that the injury had been brought about by the earth current was obtained by connecting the pipe with the rails, when a flow of 7 amperes was observed. Other pipes lying deeper in the ground, and further from the tram-rails, at the same place were found to be in good condition; but where they crossed the upper pipe, corrosion had occurred, due to the passage of current from the lower to the upper pipe, and thence into the ground and into the rails.

From the foregoing investigations, the following general lessons are to be learned: Those mains are most endangered which form a connection between the sections of the rails that exhibit a high potential and those that exhibit a low one, or which form a connection between spots well connected through the earth with sections of different potential. In general, the most critical situation is in the neighbourhood of the return conductor, or of other points of low potential; but the amount of resistance between the mains and the rails, and the chemical nature of the ground, have much influence upon the position of the most critical spots. Corrosion is often to be found where two pipes forming connections between points of high and points of low potential approach or cross one another. At places where mains having a potential positive to that of the rails cross those rails, injury is peculiarly likely to arise. The extent of the damage is largely governed by the nature of the soil, and by local conditions, such as the presence of water.

The abstract of Herr Spindler's report given by the Commission is brought to a conclusion by a set of rules which he proposes should be adopted for the protection of gas and water mains; but since these are reproduced or amplified in the similar rules drawn up by the Commission itself, they may be passed over. The Commission do not make any remarks or criticisms upon Herr Spindler's report, but pass at once to their own code, which is entitled

Draft of Rules for the Protection of Gas and Water Mains from Electrolysis caused by Leakage of Energy from Electric Tramway Systems using Direct Current where the Rails are Employed as Return Conductors.

(1) *Current.*—The trolley wires are to be connected with the positive pole, and the permanent way with the negative pole, of the source of energy, by means of insulated leads.

(2) *Rails.*—All the rails which are employed as return leads are to be made as good conductors as possible. To this end:

(*a*) If they are not welded, the ends of all rails are to be joined by means of copper wire not less than 8 millimetres in diameter. This rule applies to cast joints also. The resistivity of the finished track is never to be more than 20 per cent. higher than that of an unjointed track of equal length.

(*b*) Every 50 metres or less, the two rails of each track are to be connected together with joints of the size and kind already described; and every 100 metres or less, the rails of all parallel tracks are to be connected together, but with joints of at least double the above diameter.

(*c*) At all points and crossings, and where they cross other systems, every rail of a street tramway must be fitted with a connecting piece, constructed to satisfy Rule 2a, which bridges over the whole point or crossing.

(*d*) Wherever the permanent way is broken, as at swing bridges, the two portions of the track must be well connected by means of insulated cables of suitable size.

(3) *Difference of Potential in the Rails.*—The difference of potential in the rails is not to exceed a certain prescribed amount.

The precise maximum figure for each place must be settled according to local conditions, and will be governed by the nature of the soil, by

the difference between the highest and the lowest potential found in the mains, by the resistance between the points where highest and lowest potential are observed, and by the position of the mains in relation to the rails. In special cases this maximum permissible figure may be varied in different sections of a tramway system. Provisionally, this maximum may be taken as 1 volt; the figure being the mean of readings extending over 10 minutes at a time of full load.

(4) *Return Conductors.*—If the rails are not competent to carry away the current without allowing the difference of potential to exceed the prescribed limit, return conductors must be provided. These conductors are to be so numerous and so arranged that, in conjunction with the rails, they prevent the difference of potential at different parts of the permanent way from exceeding the prescribed figure. The return conductors must be connected with the rails at places where the mains are at the greatest possible distance therefrom. The return conductors are to be insulated, and of sufficient size to carry away the current with a small drop in voltage, so that any occasional loss of conducting power in the rails may not cause the difference in potential between any two points where those conductors are attached to exceed the limit. The return conductors should have a diameter at least equal to that of the outward leads; but when several are employed and other conditions suggest it, their diameter should be greater.

(5) *Return Conductors from other Installations.*—When stationary motors, lighting, or other plants are supplied with current from a street tramway in which the rails are employed as return conductors, they must be connected with the return conductors or with the rails through insulated leads. Care must be taken that the differences of potential in the track are not made to exceed the limit by these arrangements. It is not allowable to connect one pole of such motors or dynamos to earth. The stand of the motor must be earthed; but the stand must not be in electrical connection with one of the poles.

(6) *Adjustability of the Return Conductors.*—In keeping down the difference of potential in the track, and therefore in diminishing the extent of the stray currents, it is of great importance to see that the potential in the track is identical at all points where return conductors are attached. For this reason, the resistance of a return conductor must be suited to the strength of the current it has to carry away, and must be capable of regulation. Each return conductor should be provided with an adjustable resistance which can be so set that in all leads the products of current into resistance are as nearly as possible identical.

(7).—In districts where the return conductors are liable to be frequently or seriously overloaded, it is recommended that steps shall be taken automatically to regulate the potential of the rails at the places where the returns are attached.

(8) *Controlling Apparatus.*—Testing wires should be led to the generating station from all points of attachment of the return conductors, and from all points of highest potential in the rails; voltmeters should be provided to enable the potential at these points to be adjusted; and ammeters should be in readiness to measure the current flowing in each return conductor. Whenever any of the mains have to be opened up or tested, it is recommended that the opportunity should be taken of attaching testing wires to them. These wires should terminate in small boxes attached to the walls of buildings, where they are available at any time when tests are needed of the quantity of current flowing in the mains, or of the difference in potential between the mains and the tram-rails.

(9) *Resistance between Rails and Earth.*—The resistance between the ground and the rails that are carrying current should be as high as possible. When this is not naturally sufficient for the purpose in view, steps should be taken to increase it. The rails should be laid on a dry bed of gravel or ballast; or upon concrete foundations at least 25 centimetres wide and 15 centimetres deep, over which a layer of asphalte at least 1·5 centimetres thick, and projecting at least 5 centimetres at either side of the rails, should be put. It is of great importance to render the road surface between and near the rails impervious to moisture, and to drain the sub-soil. The whole tramway track is best finished in asphalte, or in stones or wood set in asphalte; the joints being made water-tight to a distance of at least 50 centimetres beyond the two outermost rails. The employment of salt for the removal of snow and ice acts prejudicially, and it should therefore be entirely prohibited, or only permitted in cases of necessity. Metallic connections between the rails and the earth, or between the rails and metals in the earth which do not form part of the tram equipment, must not be made, and where they exist, must be removed.

(10) *Connections between Mains and Rails.*—Metallic contact between the gas or water mains and the rails, or the return conductors, or the negative pole of the dynamo must not occur. Such connections bring the mains into parallel with the rails or the return leads, and encourage destructive action at all places (joints) in the mains where the contact is imperfect.

(11) *Distance between Rail and Gas or Water Fittings.*—The shortest permissible distance between a tram-rail and such gas or water fittings (hydrants, stopcocks, and the like) as are in metallic contact with the mains and approach or reach the surface of the road is 1 metre. If it is impossible to keep the fitting at such a distance from the rails, it must either be removed altogether with its accessories, or the electrical connection between it (*e.g.*, any surface plate lying in the tramway) or the upper layers of earth and the mains must be broken by means of brickwork, jacketing tubes of earthenware, or other appliances.

(12) *Precautionary Measures.*—For a distance of at least 1 metre on either side of the outermost rail, mains which pass underneath the tram-lines are to be insulated, or they must be run inside jacketing tubes that are in good electrical contact with the mains. Where mains which are liable to exhibit differences of potential that are not negligible in quantity approach or cross one another, they should be brought into good electrical contact.

(13) *Scope of the Precautions.*—When electric tramways run through districts where there are no gas or water mains, these rules may be partly or wholly ignored.

(14) *Examination of Existing Installations.*—In all existing tramway systems, the actual electrical conditions of the permanent way and of the return conductors are to be investigated at full load, in order to ascertain to what extent they fulfil the requirements of these rules. There should be measured:

(*a*) The differences of potential between certain points on the permanent way (points where the return conductors are attached, points where the potential is presumably highest, &c.) and the negative pole of the dynamo.

(*b*) The differences of potential between the points mentioned in (*a*) and a suitable "earth" lying in water.

(*c*) The differences of potential between the largest possible number of points on the mains and the negative pole of the dynamo. The points tested should be suitably distributed over the district.

(*d*) The differences of potential between the rails and mains at the above-mentioned spots. It is most advisable to make these measurements on the water-mains. The testing instruments should be applied directly to the mains or to hydrants; valve spindles and the like do not afford good enough contacts.

The results of these measurements should be marked on a plan of the tram system, so as to show the potential of the rails with reference to the minus pole of the dynamo, and with reference to the mains; and also to indicate those positions where the mains are positive to the rails, and where therefore current is likely to leave the mains for the rails or the ground.

The differences in potential between suitably selected positions (hydrants, &c.) should be ascertained when the trams are not running, as well as when full power is being supplied. From these figures the directions of the currents in the mains should be noted, and an opinion should be formed of the districts in which current is likely to leave the mains. If necessary, the volume of the currents in the mains may also be measured.

In such districts as have just been referred to, particularly where mains and rails approach or cross, and more especially in the neighbourhood of the return conductors, the ground should be opened, and the condition of the pipes inspected.

After the passage of a (heavily laden) car, measurements should be made to see if, and where, current is likely to leave one main for another. At such places the difference in potential of the mains should be ascertained when the tram system is fully loaded, and the mains themselves should be examined.

In the foregoing manner, an indication will be given of the places where steps should be taken for the protection of the mains. By the quickest possible application of the adjustable resistances mentioned in (6) and the measuring arrangements referred to in (8), a great improvement in the electrical conditions will most probably be obtained in very many cases.

(15) *General Control.*—While the trams are running, and especially at times of greatest load, the potential in the rails must be regulated as may be necessary in the generating station. The resistances of the return conductors are to be so regulated that the potential at all places where the return conductors are attached shall be identical. At the same time, the quantity of current flowing in each return conductor shall be adjusted. Such adjustments are specially to be made whenever the running conditions alter. When the insulation of the conductors is being tested, which shall take place at least twice a year, the joints on the rails are to be examined in order to ascertain whether they fulfil the regulations of (2*a*).

The results of all measurements that are made in the generating station, before and after the adjustment of the resistances, also those of the examination of the rail joints, &c., are to be entered on a form which shall be open to the inspection of the gas and water officials at all times.

Cyanogen.—In the "Comptes Rendus," M. Berthelot has described some thermo-chemical investigations on the solution and polymerization of cyanogen. He measured the loss of energy which takes place when cyanogen reacts on water, when potassium cyanide reacts on dissolved cyanogen, when cyanogen reacts on alcohol, and when potassium cyanide reacts on an alcoholic solution of cyanogen.

Marriages.—At St. Mary Abbot's, Kensington, last Tuesday, the marriage was solemnized of Professor Vivian B. Lewes and the youngest daughter of Colonel Lewis-Jones, J.P., of Westgate-on-Sea. It was witnessed by a numerous attendance of friends, who afterwards, at a reception at the Royal Palace Hotel, Kensington, offered the bride and bridegroom the customary felicitations and good wishes, to which we cordially add our own. At the Trowbridge Tabernacle Church, a few days since, the marriage was solemnized of Mr. Ernest A. Sainsbury, the Manager of the British Gaslight Company's station at Holywell, and Miss Fanny Winifred Hill, eldest daughter of Mr. E. Fear Hill, one of the leading tradesmen of Trowbridge. The bridegroom is the son of Mr. H. Sainsbury, who was for many years Manager of the Company's Trowbridge station.

Gas v. Electricity for Public Lighting in Kensington.—The Borough Council of Willesden is one of those municipal bodies which has embarked the fortunes of its ratepayers in an electric lighting installation. The Council, with a not unnatural desire to do business, recently proposed to the Royal Borough of Kensington that each of the two boroughs should light with electric arc lamps its own side of a considerable strip of the Harrow Road, the north side of which is in Willesden, and the south side in Kensington. The Kensington Borough Council referred the matter to their Works Committee, who directed their Lighting Engineer to report upon it. The report of this officer was to the effect that the annual cost to the borough of the proposed electric arc lighting would be rather more than seven times the present annual cost of lighting that portion of the road by gas. The Kensington Council consequently declined to accede to the proposal.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Contractors and Engineers.

SIR,—Your readers must not conclude that I do not condemn absolutely such unworthy conduct as some of your "contractor" correspondents attribute to engineers.

I am hoping to have leisure on a voyage that I am shortly making to America, to deal at length with two important notes on this subject, which have appeared in your columns; and I have waited to draw as much "fire" as possible before replying.

Meanwhile, Mr. Holliday's somewhat cryptic allusions to "cheques" required to complete certain works in his knowledge. are perplexing. Does he refer to the making good of blunders due to the engineer's incompetence, or to cheques given corruptly to such engineer?

I should condemn both; but my address referred to a practice equally bad, if not fraudulent—viz., the incompetent engineer putting forward contractors' plans as his own, and getting the estimates and contracts passed in this way, so as to exclude proper competition for such works, and worse, did not provide suitable or economical designs at all.

I have been too pressed to get leisure to deal with this yet; but I fully intend to.

Aug. 13, 1904. H. E. JONES.

SIR,—As to your notes under "Engineers and Contractors," p. 380, I am sufficiently well acquainted with your fair "Editorial Notes" in the "JOURNAL" to believe you probably would not have penned them as you did had you known the other side of the story.

Previous to your informants being written to, a gas engineer, contractor, and carbonizing specialist had (unsolicited) placed his plans and tender for consideration, which were all but accepted. I said: "No, it would be manifestly unfair to the company to accept this when there are other equally good specialists who would doubtless be pleased to compete on similar lines for a complete installation." I believed your informants had a special setting; and there were long odds in favour of the firm getting the work, not (as you say) "against" their doing so.

Your informants' tender would be perfectly useless without the details asked for, to make a comparison with the mentioned considered tender. In this particular instance, have your informants not done considerably more than was invited, and unsolicited asked to do still much more, which was refused?

Under the special circumstance I consider that the letter was a perfectly legitimate business one; and while in your opinion the questions are of a "commonplace type," each and all of them are much disputed. Even take the first? What do you consider the most popular size of retort? I know of six gas-works within a comparatively small radius of each other, working the same coal and similar in capacity, and every one using a different sized retort. Each manager declares his own the best.

Surely you are under a delusion in stating the mass of labour that would be required in answering the questions. They could be amply dealt with at insignificant cost. I would not have been a party to the questions, had I expected more than tracing copies of the firm's speciality. A tender based on my own designs would have entailed much more labour and technical skill.

A quarter-of-century experience leads me to say that, for a gas-works to be up-to-date, it is necessary to have some conspicuous evidence of the specialities now before the gas world.

My one desire was to do the very best for my clients, under the special circumstance; and this I believe is the basis of Mr. Jones's remarks at the recent Institution of Gas Engineers meeting.

Aug. 13, 1904. CONSULTED.

PARLIAMENTARY INTELLIGENCE.

ELECTRIC LIGHTING PROVISIONAL ORDERS.

In the House of Commons, on Monday last week, Colonel Denny asked the President of the Board of Trade if he would state how many Provisional Orders for electric lighting had been granted to local authorities and others during the five years ending Dec. 31 last; what was the average length of the time granted by the Board of Trade for the completion of the works; under how many of these Orders had works been begun; what was the nominal capital of the companies or others applying for the Orders; in how many of the Orders under which work had begun were the works being carried out by those to whom the original Order was granted; and was a clause generally inserted in the Order requiring an applicant to satisfy the Board within any stipulated time that substantial progress had been made. Mr. Gerald Balfour, in reply, said the number of Electric Lighting Provisional Orders granted during the period named was 268 to local authorities and 132 to companies and others. In nearly every case the length of time prescribed for the completion of the works in the streets specially named in the Order was two years. The Board of Trade had not the necessary information to enable them to state the number of Orders under which works had been begun or the nominal capital of the companies or others applying for the Orders. Powers had been transferred by the grantees to other bodies in 35 cases, under special powers contained in the Orders. The answer to the last inquiry was in the negative; but applicants (other than local authorities) were required, within six months from the commencement of the Order, to deposit or ensure a specified sum as security for the execution of works, and to show to the satisfaction of the Board of Trade that they were in a position fully and efficiently to discharge the duties and obligations imposed upon them by their Order throughout the area of supply.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the third time and passed: Belfast and North-East Ireland Electricity and Power Gas Bill, Newcastle and Gateshead Water Bill, Oakengates, Dawley, and District Joint Water Board Bill.

The Leeds Corporation (Consolidation) Bill is not to be further proceeded with this session; but the promoters have been granted leave to introduce it next year as at the stage it has now reached.

LEGAL INTELLIGENCE.

DARTFORD POLICE COURT.—Friday, Aug. 12.

(*Before Mr.* H. B. HOHLER, *Chairman, Mr.* W. VINSON, *and Mr.* V. HUDSON.)

The Erith Urban District Council and the West Kent Gas Company. A Question Regarding Road-Opening Notices.

To-day, the West Kent Gas Company appeared in answer to eight summonses taken out by the Erith Urban District Council in regard to the opening of various streets in their area without giving notice, as required by law. Some time ago, the Company decided to connect the Crayford Gas-Works with Erith, and to manufacture all gas at the latter place. This necessitated the laying of about 3 miles of mains from the Erith works to the holders at Crayford; and it was with reference to the carrying out of the work that the dispute arose.

The Council were represented by their Clerk, Mr. C. H. FRY; while Mr. R. CUNNINGHAM GLEN appeared for the Gas Company.

Mr. FRY, in opening the case, explained that the Company were incorporated under the West Kent Gas Act of 1867. There was nothing in the Act itself to permit the opening of streets; but there were incorporated in it sections of the Gas-Works Clauses Act, 1847, by virtue of which the Company were authorized to open streets, subject to the provisions contained in the latter Act. The matter was dealt with in sections 6 to 12; and the summonses were taken out under section 8, which stated that before the Company opened up any streets, &c., they should give to the persons under whose control or management the same might be notice in writing of their intention, not less than three clear days before beginning the work, except in cases of emergency. Detailing the events which preceded the issue of the summonses, he said that on Oct. 5, 1903 (more than nine months before the first date mentioned in the summonses), formal notice was given by the Gas Manager, Mr. A. Box, of the Company's intention to open certain roads and paths for the purpose of laying certain gas-pipes. The main in question was laid immediately following the notice. He believed it was laid before the end of November up to the point referred to—from the Erith Gas-Works to the Britannia Bridge. In October, they gave the notice; and, after some correspondence, the Company were requested to submit a plan showing the route of the proposed main. When the bridge was reached, there was a difficulty, as it was found there was not sufficient depth to permit of the laying of a 12-inch gas-main. Negotiations took place with reference to getting the main over the bridge; and these caused considerable delay. He was, however, sticking to the notice dealing with the portion of the main from the Erith Gas-Works up to the railway bridge. What happened beyond that he did not think was matter for discussion on the present summonses. In November, another notice was served by the Company, of their intention to break open the road from the bridge approach to the boundary of the parish of Erith; but he wished it to be distinctly understood that the eight summonses were in respect to openings on the section referred to in the earlier notice. His point was that the main referred to in the first notice was laid before the end of November. Some drains were disturbed, channelling was broken up, and so on; and these works were re-instated by the Surveyor. The trenches were also filled in, and from time to time re-instated. At the end of March, some of the footpaths were tar-paved, starting at the gas-works; and the Gas Manager then wrote calling the attention of the Surveyor to the fact that the Company had not yet finished with the path and roads where the 12-inch main was laid, and saying that it would be quite another two months before the pipes, &c., were tested. By this time, about 500 yards of tar-paving had been done; but on receipt of the letter, the Surveyor stopped the work. Subsequently to this, the Company made a number of openings and tested the main; and afterwards the Surveyor again temporarily re-instated the road, because it was left in a dangerous condition. In order to keep the paths and roads fit for traffic, he had to re-instate them. On July 6, without any notice, the Surveyor found the Company opening the road—that was, nine months after the first notice—and was told they were testing a cable that was laid alongside the main. This opening up was continued on the various dates mentioned in the summonses. In all there were seventeen openings, every one of which was for the purpose of repairs to a telephone cable which had, without any notice to the Council, been placed by the side of the gas-main while they were doing the other work. The laying of the main and cable was carried out simultaneously; but the tests were made nine months afterwards. In October, the road was opened and filled in and re-instated; in April, it was again opened; and in July, the same thing

happened once more. The only notice the Council had was the one dated Oct. 5.

The CHAIRMAN: I take it, Mr. Glen, your contention is that it is all one matter?

Mr. GLEN: Yes; until the road is re-instated.

Mr. FRY said the Court must put a reasonable construction upon the Act. The work had to be done under the superintendence of the Surveyor; and it was done. The notice referred to one opening; and these openings were made in the months of October and November, and filled in. The Company temporarily filled in up to the level of the road. Then subsidence occurs, and the Council re-instate. For opening again, a fresh notice was required. It could not be reasonably contended that the Company could go on for nine months opening the main road, or any road in the district, at their sweet will, without any notice to the persons having the control of the roads. The notice of Oct. 5 referred to the laying of the main, which was done in that and the following month; and if they wanted to open again in July for any purpose whatever, they should have served a fresh notice. The notice could not extend over an unlimited period.

Mr. *Howard Hind*, the Council's Surveyor, proved the receipt of the notice referring to the opening on the road from the Erith Gas-Works to the Britannia Bridge. On getting the notice, he wrote to Mr. Box asking him to specify the particular streets it was intended to open and break up, the size of the pipe, the depth at which it would be laid, and the date on which it was proposed to commence the work. A day or two later, he received a plan of the proposed work, which he approved subject to the conditions (1) that the breaking up of the streets should be done under his superintendence, and (2) that the main should be laid so that there was not less than 3 feet between the top of it and the surface of the road. In his reply, Mr. Box said that of course the work would be done under his (witness's) superintendence; but he could not undertake to lay the main so as to conform to the other condition. He added that the men were ready to start, and that if they were stopped, the Council must be prepared to meet any expense incurred. Witness thereupon wrote asking for an undertaking that the main should be laid not less than 3 feet from the surface, except where this was impossible; and Mr. Box afterwards wrote on the plan that the main was to be laid 3 feet in depth. The section of main referred to in the first notice was completely laid during November. On Dec. 4, he received a further notice from the Company of their intention to lay a main from the bridge to the boundary of the district; but previous to this, he had written to Mr. Box saying he noticed that the Company had commenced excavations for the 12-inch main south of the bridge, of which no plan had been submitted. When the Company laid the main, they temporarily re-instated the trench. They only filled in earth round the pipes up to the level of the road; and of course this subsided. The Company finished their work before Nov. 30; and subsequent to that date, he from time to time filled in the trench to keep the roads fit for traffic. In March, he instructed the workmen to proceed with the tar-paving of the footpaths; and early in April, Mr. Box wrote calling his attention to the fact that the Company had not finished with the paths and roads where the 12-inch main was laid, and stating that it would be quite another two months before the main and cable were tested. He had never received notice of the Company's intention to lay this cable. Just before the intimation referred to, fresh openings were made by the Company in various places, to test the main; and the roads were opened again afterwards, to put in syphons or for testing purposes.

The CHAIRMAN: So far as you know, no test was made of the main until this time?

Witness: No. After the openings were made in April, they were filled in by the Company; but they required attention. It was a very long trench; and the Council had been repairing it from time to time since the Company's contractors left it. After the tests in April, there was a short interval—about two months—during which the Company left the roads alone. Nothing was done to them, and they were getting very dangerous; but the Council continued to fill them in as required. Then, in July, they found the Company were again opening up the line of the main in various places to test or repair the telephone wires.

The CHAIRMAN: After the mains were laid, you filled in the trench and charged the Company with the cost?

Witness: We have not yet charged the Company.

When do you say the main was laid?—On Nov. 30. This was why he went on with the repairing of the tar-paving and the permanent re-instatement.

Mr. HUDSON: Did they open the path where you had put the tar-paving?

Witness: Yes, in three or four places. Previous to the fresh openings in July, he received no notice from the Company of their intention.

Cross-examined, witness admitted that they had done no more tar-paving since the receipt of the letter from Mr. Box. The Company had not from time to time been filling in the trenches, up to the previous day.

Mr. GLEN: Of course, under the Act, the Company are liable for any work that is necessary until the roads are re-instated, and you look to the Company to recoup the Council. So long as the road continued to subside, you would consider that it had not been properly re-instated.

Witness: That all depends. If the road has a fairly good surface, and if it is subsiding, I should consider it was in proper condition.

And if it subsided afterwards, you would not call on the Company to repay the Council?—Yes.

How could you call on them if the road had been re-instated?—If the road had been re-instated up to a certain point, and the Council found it continued to subside, they would still call on the Company to make it good.

I thought so. And the road has been subsiding until quite recently. The main is for the purpose of getting rid of a high cartage rate for coal, and so cheapening the gas. It has been suggested that a telephone cable has been laid without your knowledge; but you have been on the works, and you have seen a cable laid down?—Not to know what it was for. I have seen something; and if it is a cable, I consider it is laid in the wrong way altogether.

The MAGISTRATES' CLERK: But you considered it was covered by the notice, or you would have objected.

The CHAIRMAN: You were there, and you must have seen it.

Witness: I saw a pipe; but it was more like a piece of string.

Mr. GLEN: As a matter of fact, it was a lead pipe. The question is whether it was laid at the same time.

In reply to further questions, witness admitted that the pipes required testing when put down; but he maintained that it was quite possible to test short lengths before they were filled in. For the purpose of testing the main, the road was broken up before and after April 2; but no proceedings were taken in connection with that. The breaking up that was complained of was for the purpose of testing the cable. The laying of the main to the bridge was finished in November. There was a delay in getting it over the bridge, owing to a dispute between the parties, which was not finally settled until June. The Company originally intended to lay the main at the usual depth of 2 feet from the surface. He insisted on a depth of 3 feet to the top of the pipe, which meant a 4-foot trench; and this would take longer to consolidate than a shallower one.

Re-examined: The Company had not done any repairs until a week or two ago; but during the past fortnight they had done something. It was generally possible to tell when subsidence had stopped; but, of course, a good deal depended on the weather and the soil. He would make no permanent re-instatement until the road had finished subsiding.

The CHAIRMAN: Did you make the road good after the main was laid in November?

Witness: Yes; we have kept on filling in the trench ever since they left it, until quite recently, when they had made up their minds to do it themselves.

Mr. FRY: Has this work been done by the Company since the issue of the summonses on July 22.

Witness: Yes.

Alfred Clark, the road foreman to the Council, said he remembered the laying of the main in question—from West Street, in which the gas-works were situated, to Britannia Bridge.

The MAGISTRATE'S CLERK said the point was, Had the Company a right on the first notice to break the road up again?

Mr. GLEN: We say it was not breaking it up again.

Mr. FRY: The Company only filled in the trench after the main was laid—that is, in October and November. Until the last fortnight, did you see the Company doing any repairs?

Witness: I know they have seen a place settle, and have filled it in, but very rarely. On behalf of the Council, I have done a good bit; and the Company have done some.

This closed the Council's case.

Mr. GLEN said what the Company had to do was to give notice of intention to break up the streets for the purposes of their undertaking. They had not to give it for any particular purposes; it was for them to consider whether the purposes were right and proper ones. Having given notice of their intention to break up the streets, it was quite clear that they had not to give a notice every time they put a spade in the ground. There must be some time over which the notice might extend; and the Act said what that time was, because it stated that the undertakers were to re-instate what they had broken up. The notice must cover the time until the re-instatement; during this period, it was not a case of re-opening. His contention was that it was not re-opening so long as the work was going on. Until the road was re-instated, the notice must cover whatever was done; otherwise every time any little work was done, there would be a fresh notice. A street must be temporarily restored, in order to be free for traffic; and from time to time the trench had been filled up in this way. The proper remedy of the Council, if there had been any unnecessary delay, was to take proceedings in respect of the delay. This had not been done; and therefore the Bench must take it that there had not been any delay in re-instatement. These roads had not been re-instated, because up to the previous day the Company had been re-instating and filling up. The Council might themselves have been doing work, but it was as the agents of the Company; and they were going to charge the Company for it.

The CHAIRMAN: The work was really done on Nov. 30 as far as the bridge. It could not have been completed after the trench had been filled in.

Mr. GLEN: The work is not completed until the pipes are tested.

The CHAIRMAN: How long does the notice extend? It might go on for a year.

Mr. GLEN: It does with regard to gas-mains. Upon their own admission, it went on in regard to the testing of gas-mains until after April. They took no steps in respect of that. The testing of a gas-main necessarily takes a considerable time. Continuing, he said that the road had not been re-instated in accordance with the Act. If it had been, then there could be no claim against the Company for any repairs. But until it was re-instated the Company's liability remained. They were responsible, and they might keep the trench open; but because they had temporarily filled it up for the benefit of the public, was it to be said that the notice was at an end?

The CHAIRMAN: If they fill it up for the benefit of the public, and the public can use it, so far it is re-instatement.

Mr. GLEN: With respect, I say, No. As far as the part that was tar-paved was concerned, this was done without the knowledge of the Company; and as soon as they became aware of it, they communicated with the Council, who stopped the work. If the road had been completely re-instated, then I agree that it would have required a fresh notice. The point is how long the notice can extend. It extends so long as it is reasonably necessary for the Company to get at their pipes. I propose to call evidence to show that it was impossible, under the circumstances, to have tested these pipes earlier than they were tested, and that until they were tested the work could not be said to be complete.

Mr. VINSON: From your point of view, there is no limit to the notice.

Mr. GLEN: It is a reasonable length of time when the roads should be re-instated. If the Company are too long about the re-instatement

of the road, the Act provides a remedy—but not this remedy. The Act says: "If the undertakers make any delay in completing any such work, or in filling in the ground, or re-instating and making good the road or pavement . . . so opened or broken up . . . they shall forfeit . . . a sum not exceeding £5 for every such offence."

The CHAIRMAN: They had filled in.

Mr. GLEN: But they had not re-instated.

The CHAIRMAN: The Act says "fill in" or "re-instate."

Mr. GLEN: Until there is re-instatement, there is liability on the part of the Company; and if there is delay in re-instatement, the proper remedy is to proceed for penalties for not re-instating. The notice of intention to break open the streets is for the purpose of doing certain work. The notice extends until the work is completed; and the road cannot be re-instated until the work is completed. The work is not completed in the present case until the mains are properly tested, and the cables properly tested too; and so long as that is necessary the road cannot be re-instated.

Mr. HUDSON: Is it necessary for them to have a cable for the purpose of supplying gas?

Mr. GLEN: Yes; I am coming to that.

Mr. HUDSON: They have gone on without it for many years; and now it has become necessary.

Mr. GLEN: It is not for the Bench to decide what is necessary for the purpose of supplying gas; that is for the Directors. I will, however, satisfy you that it is necessary. The Company have laid the main solely and purely in order to be able to make their gas at Erith and supply their holder in Crayford with gas. Formerly, the gas was made at Crayford; but owing to heavy charges for cartage of coal from Erith to Crayford—about 5s. a ton—the Company decided to give up manufacturing at Crayford, and make all their gas at Erith.

The CHAIRMAN: The work was finished in November.

Mr. GLEN: No; it was not finished. It was impossible to test these mains; and they could not be finished. I think it stands to reason that you cannot call a main finished unless you ascertain whether it will hold gas. Until you have ascertained that it is capable of doing that, the work is not completed. If there is any unreasonable delay in doing this, then other proceedings should be taken. It was necessary to test the pipe throughout its whole length; and when tested and found faulty in any place, it was necessary to make good the defect.

Mr. HUDSON: You contend that you could not have tested the main as far as the bridge until it was laid all the way to Crayford?

Mr. GLEN: Yes; and it was through the delay occasioned by the Council that the Company could not get forward. The main is not completed until it has been ascertained that it is capable of doing what it is intended to do. If the work has not been completed—and until it is tested, it is not completed—it is reasonable that the Company should not re-instate the road; and my contention is that the notice extends until the time when they ought to re-instate. There has not been any unreasonable delay. One cause was the insisting by the Council on the laying of the main in a 4-feet trench.

Mr. *Frederick Stevens*, the Chairman of the Company, explained that the cable was laid for the purpose of automatically telephoning when the holder at Crayford was full. There was a connection with the top of the gasholder, so that when it rose to its full height it would ring a bell at Erith, as a signal to stop pumping. They could not have tested the first portion of the main before the rest was laid, because they wanted to get it right through before they charged it with gas, for the sake of safety. Until the main was charged with gas, they could not ascertain that it was in working order. A main could be tested in lengths; but it would be dangerous. The right way was to lay the main, and then charge it when completed. The road had never been re-instated. Up till the previous day the Company were at work on it. He had given orders for the subsidences to be filled in; and the Company kept a supply of granite for the purpose. The Company objected to the Council repairing the roads, and preferred to do it themselves. As far as the tar-paving was concerned, the Company were themselves restoring that.

In answer to Mr. FRY, who asked or a description of the cable laid alongside the pipes, witness said it consisted of wires surrounded by a leaden tube about ⅜ inch diameter.

Mr. FRY: I say they had no right to lay the cable.

The CHAIRMAN: We have not to decide that.

At this stage, the CHAIRMAN stopped the case, and announced that the Bench had decided to dismiss the summonses; but that the Gas Company would have to pay costs.

UNLAWFUL USE OF WATER.

On the 5th inst., Mr. John Drake, of Dundridge Lane, St. George, Bristol, was summoned on a complaint that, being a person supplied with water by the Bristol Water-Works Company for domestic purposes only, he used this water for other than domestic purposes on June 29. There was a second summons against the defendant for affixing a pipe to a service-pipe without the consent of the Company. It was agreed to take the two summonses together.

Mr. GERRISH, in opening the case for the prosecution, said on Sept. 25, 1890, the defendant entered into an agreement with the Company for the supply of water for domestic purposes, and since then he had not asked to be supplied with water otherwise. He carried on a business of selling vegetables from his garden, which was 1¾ acres in extent. On the 29th of June, one of the Company's inspectors passed the defendant's house, and saw passing through the wall a hose, the end of which was in one of three barrels just outside the house. The inspector went to the house, saw the defendant's wife, and made certain inquiries; and he found that the hose was attached to the tap in the back kitchen, that it passed through the wall into the yard, and that the end was hanging over one of the barrels. Water was flowing through the pipe into the barrel. The tap in the kitchen was the only one on the premises; and the defendant's wife said they had plenty of soft water in a cistern under the kitchen. On the 14th of July, the Chief Inspector of the Company went to the premises with the inspector who had previously been there, and he saw a similar state of things. Dealing with the second summons, Mr. Gerrish said the object of the section was to prevent people putting hose or pipes all over their houses, unless the Company had supervision.

Mr. *Ernest R. Abbott*, the Chief Inspector of the Company, gave evidence as to visiting the premises on the 14th of July, and finding the hose attached as described. He drew the defendant's attention to the fact that he was using the Company's water by means of the hose; and the defendant's wife said they used the water in the barrel for washing lettuces. The defendant said he had plenty of soft water, and showed him a well in the garden. Since his visit, Mr. Drake had been to the offices of the Company, and said he would be willing to take the water by meter if the Company desired it.

Defendant said the water coming through the hose was waste water, owing to a leakage in the tap. He had plenty of soft water, and only had the Company's water for drinking purposes. It was true that his wife had washed some lettuces in the water in the barrel, but as it was waste she thought she had a right to use it.

Mr. GERRISH said the Company did not press for a heavy penalty, but they wanted to put a stop to the sort of thing the defendant had been doing.

A fine of 10s. was imposed.

Proceedings were recently taken at the Exmouth Petty Sessions, at the instance of the Urban District Council, against Mr. John Hay Clarke, a resident in the town, for infringing the local bye-law prohibiting the use of hose for garden purposes, except in cases where the supply is by meter. It was stated that this was the first case under the bye-law, which it was pointed out was clearly in the interest of the consumers as a whole. As the proceedings were initiated as a warning to consumers generally, the Council did not press for a penalty. Defendant, who said he agreed with the principle of the bye-law, and had since had a meter fixed, was ordered to pay the costs.

RATES AND GAS AND WATER CHARGES IN SOUTH COAST TOWNS.

The following tables, relating to the rates and water charges in some of the principal South Coast towns, have been prepared by the Town Clerk of Plymouth (Mr. J. H. Ellis); the figures with reference to the average gas consumption in Plymouth having been obtained with the assistance of Mr. J. A. Bellamy, the Chairman of the Plymouth and Stonehouse gas Company:—

Gross Amount of Rates and Water Charges.

Rent of House.	Brighton.	Hastings.	Portsmouth.	Southampton.	Torquay.	Devonport.	Plymouth.
£	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
80. . . .	26 18 8	28 18 0	25 11 4	33 12 0	22 8 0	25 17 4	25 10 8
70. . . .	23 11 4	25 5 9	22 8 8	29 8 0	19 12 0	22 14 8	22 11 4
60. . . .	20 4 0	21 13 6	19 6 0	25 4 4	16 16 0	19 12 0	19 8 0
50. . . .	16 16 8	18 1 2	16 3 4	21 0 0	14 0 0	16 9 4	16 4 8
40. . . .	13 9 4	14 9 0	12 18 8	16 16 0	11 4 0	13 6 8	13 1 4
30. . . .	10 2 0	10 16 9	9 16 0	12 12 0	8 8 0	10 5 0	9 18 0
	Rates 7s. 8d., water 9d. in the pound.	Rates 7s. 2d., water 1s. 4d. in the pound.	Rates 6s. 8d. in the pound, water as per scale.	Rates 9s. 7d., water 11d. in the pound.	Rates 7s., water 1s. in the pound.	Rates 7s. 1d. in the pound, water as per scale.	Rates 7s. 5d. in the pound, water as per scale.

Rates, Water, and Gas Combined.

Rent of House.	Brighton.	Hastings.	Portsmouth.	Southampton.	Torquay.	Devonport.	Plymouth.
£	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
80. . . .	47 13 1	50 4 3	42 2 10	53 2 9	43 14 3	43 12 6	37 19 4
70. . . .	39 13 0	41 16 7	35 6 0	44 11 3	36 2 10	36 10 4	32 4 4
60. . . .	35 10 1	37 8 4	31 10 10	39 12 11	32 10 10	32 14 4	28 11 8
50. . . .	31 11 1	33 4 0	27 18 10	34 17 7	29 2 10	29 1 8	25 1 4
40. . . .	20 10 5	21 14 1	18 11 6	23 9 0	18 9 1	19 7 7	17 6 0
30. . . .	15 13 1	16 11 0	14 4 10	17 16 9	14 2 3	15 0 2	13 4 8
	Gas 2s. 11d. per 1000 cubic feet.	Gas 3s. per 1000 cubic feet.	Gas 2s. 4d. per 1000 cubic feet.	Gas 2s. 9d. per 1000 cubic feet.	Gas 3s. per 1000 cubic feet.	Gas 2s. 6d. per 1000 cubic feet.	Gas 1s. 9d. per 1000 cubic feet.

For the purpose of the second table, it is assumed that the average gas consumption in Plymouth is a fair criterion of the gas consumption of houses of like class elsewhere.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel last Wednesday—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the advertisement convening the meeting and the minutes of the last half-yearly meeting, which were signed as correct. The Company's seal was then affixed to the register of proprietors; and the report and accounts, given in the "JOURNAL" for the 2nd inst., were presented.

The CHAIRMAN: Ladies and Gentlemen, I have now the pleasure to move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

REPORT OF THE DEPARTMENTAL COMMITTEE.

Dealing with the report, I think the most important paragraph is the last. "An event of great importance to the gas industry, particularly in London, has been the appointment and report of a Departmental Committee, appointed by the Board of Trade, 'to inquire and report as to gas testing in the Metropolis.'" I may perhaps read the Committee's recommendations: "Their most important recommendations are—that the test for sulphuretted hydrogen should be made less stringent; that the obligation to remove the sulphur compounds should be abolished; and that it shall not be obligatory on the controlling authority to test gas on Sunday. They do not consider testing by the portable photometer necessary; and they do not agree with a request by the London County Council that the parliamentary bargain made in 1900, when the standard illuminating power of this Company's gas was reduced to 14 candles, should be interfered with." There are one or two minor points with which the gas industry does not agree; but I will tell you the importance of this paragraph, although perhaps I am speaking to a different audience from this one—to the gas industry generally through you. The importance of this Board of Trade Committee is that it is a step—a very important step—towards the removal of most tyrannical and objectionable restrictions upon the industry in which we are engaged; and it is a step towards freedom, to enable us to do the best we can for our consumers without undue interference by the authorities. I may say that all this fuss about gas testing has never done an atom of good to anyone. Of course, it will be said that that is not an impartial remark; but I can go back to the time when there was no gas testing. For nearly fifty years of the gas supply, there was competition between gas companies generally in London and in the large towns, and it was not until at last they found that it was detrimental to their interest, and to the public interest also, that amalgamations and combinations took place. But during the early days, for a long time, there was competition, and that was considered to be quite sufficient protection for the public. It was sufficient protection. There are many places now where there is no gas testing. In the town I live in—Reigate—we are supplied by a non-statutory Company. There is no testing as to purity, illuminating power, or anything. There are no restrictions whatever; and, so far as I know, there are no complaints. I have burnt their gas for ten years; and I may say that it is just as good as London gas, where all these fussy restrictions have been in force. As far as I can learn, the consumers are satisfied; at all events, they make no public complaint. Well, our complaint about this gas testing has been that it has hindered us and hampered us in our efforts to improve the supply of gas.

THE SULPHUR QUESTION.

Take for instance this test as to sulphuretted hydrogen. It is a most absurdly stringent one; I believe it subjects us to penalties if there is as much as one part of sulphuretted hydrogen in ten million parts of gas, because the Act of Parliament says there shall be no sulphuretted hydrogen. The Referees appointed to define how the gas was to be tested were very scientific men. Science is very exact. It has none of the milk of human kindness in it, but simply says: "Parliament says that there is to be no sulphuretted hydrogen. We will devise a test whereby, if there is the minutest trace, it shall be found out." Well, now, the Departmental Committee have come to the conclusion that that is absurdly stringent, and have recommended that it should be relaxed; but the very fact that we have been under this all these years has hampered us and hindered us in a way you cannot conceive. The test has placed our managers and responsible officers at the gas-works in a constant state of anxiety; and they have had to spend many days, and often many days in succession, in trying to deal with these minute quantities, when their time might have been so much better occupied in endeavouring to improve the general supply of gas. Well, then, there is another thing—sulphur compounds. The Committee recommend that the obligation to remove the sulphur compounds should be abolished. Now, in 1860 the first Act of Parliament was passed which made it obligatory to reduce these sulphur compounds in amount. That eminent Chemist the late Dr. Letheby found out that in the gas supplied generally there was a certain amount of sulphur that was not discovered by the ordinary method of testing; and Parliaiament, in its wisdom, or rather the want of it, put in a restriction requiring the companies to reduce these sulphur compounds to 20 grains per 100 cubic feet, or about 1 part per 1000 of gas. And so we have been burdened with this restriction from 1860 up to now. The line on which the authorities have gone has been to test the gas to ascertain how much sulphur was in it, and then to argue from that if there was so much sulphur in the gas, there must be so much of sulphur products in the air of a gas-lighted room.

THE HEHNER AND RIDEAL EXPERIMENTS.

It never occurred to any of us to test the air in a gas-lighted room until last autumn, when this Company fitted up a house. It was said that in the small rooms of a workman's cottage this sulphur would be extremely detrimental; and so we fitted up a small cottage with means for testing the gas in two of the rooms. In one, the gas tested was to be purified, and the sulphur compounds reduced by lime; in the other, the gas was to be purified by oxide, which does not reduce the sulphur compounds at all, or not appreciably. I thought there would have been very little difference in the air of these rooms. But we employed two eminent Chemists—Mr. Otto Hehner and Dr. Samuel Rideal—to make experiments; and, to their great astonishment, as well as ours and everybody else's, it was found that there was very often less sulphur products in the air of these gas-lighted rooms than in the external air. There was an extraordinary thing. These people who had argued that if there was so much sulphur in the gas there must be so much in the air of the room where it was burned, were proved to be utterly wrong. Then it came to be a question: Where does this sulphur go? It was found that it was absorbed by the lime in the ceilings and the lime in the walls of the room; because these gentlemen had stopped up all ventilation. They puttied up the doors and windows, and stopped the chimneys, so that there should be no ventilation at all; and yet they could not find anything like the theoretical quantity of sulphur in the air of this gas-lighted room, but only $\frac{1}{20}$ part. Then it was suggested, when they gave their evidence before the Board of Trade Committee, that the walls and the ceilings should be varnished so that there could be no absorption of the sulphur products by the lime of the walls and the ceilings. They did that, and they found the result was much the same, and that in the air of the room there was no appreciable amount of sulphur, that the moisture produced by the combustion of the gas condensed on the varnished walls and on the windows, and in the condensation was found the sulphur products. Moreover, we were able to put this before the Committee—that only about 7 per cent. of the gas undertakings in the kingdom are under these sulphur restrictions, and only two out of the 250 municipalities, and those two did not take any notice of them—that, in fact, the municipalities did not test the gas at all. The gas is tested by themselves, no doubt, wherever the Acts of Parliament apply; but it is a mere farce, and comes to nothing. However, the result has been an emphatic condemnation by the Committee of the necessity of removing these sulphur compounds. It has been a very obnoxious thing. The nuisance caused by gas-works is produced almost entirely by the foul lime that has to be removed after it has absorbed the sulphur; and we think that the removal of the restriction is a great step towards freedom.

ILLUMINATING POWER AND CALORIFIC VALUE.

Well, ladies and gentlemen, there is one other point I have to touch upon, and that is that the illuminating power of gas is found to be a matter of very little importance. The Committee are silent about it. They do not say whether or not it should be reduced; but we find that by lowering the illuminating power we can serve our customers better with 14-candle gas than we could when we had to supply 16-candle. There is now a talk that, instead of testing gas for illuminating power, it ought to be tested for its calorific value; and I am sorry that in this week's "JOURNAL OF GAS LIGHTING" reference is made to calorific tests. Now, I must say this for the "JOURNAL." It has been consistently the friend of the gas industry as long as I have known it—that is from the time it was started more than fifty years ago. It has rendered very great service to the industry; but there is an article in it this week which speaks of calorific tests. So here we are getting free from one great obstacle—we are getting freedom from the necessity of purifying the gas, getting free from these absurd restrictions - and now it is suggested that we should put on other fetters. I have heard of slaves who, after having been freed, so little appreciated and so little valued their freedom, that they have voluntarily gone back to slavery. But I wish to say here, for the gas industry and to the gas industry, that there must be no more of these fetters put upon us. We must have no tests for calorific power. I will tell you why. In the first place, there is not the slightest necessity for it; in the second place, nobody knows what calorific power is the best for the users or consumers; and, in the third place, and for the strongest reason of all, gas is a fuel in competition with all other fuels. If we, the gas companies, cannot supply a fuel that is to the advantage of the public, they will not take it. For instance, we are in competition with coal of all kinds and quality, from slack to anthracite; we are in competition with coke of various qualities; we are in competition with our own tar, which may be used as fuel; we are in competition with several kinds of gas—Dowson gas, producer gas, and Mond gas, which some of the consumers can make themselves on their own premises; we are in competition with petroleum in its various forms, as fuel; and we ask and demand that we shall be left perfectly free to supply the gaseous fuel that we find, and our customers find, to be most advantageous. There are those who talk about a calorific value of 500 units, and they want to fix us to this, that, or the other; but nobody knows what calorific power is most advantageous. The calorific power and the price at which the gas can be supplied must be taken together. I wish to utter my protest—the strongest protest I can make—against going back to these fetters; and the gas industry must take care that they do not favour it in any way. The article winds up by saying, "The handwriting is on the wall." But what was the handwriting on the wall? "Thou art weighed in the balances, and art found wanting." Well, hitherto gas has not been "weighed in the balances and found wanting;" and if we were so foolish, having once got freedom—freedom is in sight now—as to allow the fetters to be put on again, I should say that that remark applied to us, that the handwriting is on the wall, and that it would be perfectly true to say of us that we have been "weighed in the balances and found wanting" if we should be so weak as to assent to anything of that kind. I have taken up a good deal of your time in speaking to you about this, but I feel it is of such importance that something must be said very emphatically.

WORKING RESULTS AND REDUCTION IN PRICE.

Now I will revert to the first paragraph of the report, and here let me say it was a great satisfaction to the Directors to find that the result of the half-year's working enabled them to reduce the price of gas another 1d. per 1000 cubic feet. It was unexpected. We none of us expected, when we reduced the price 2d. last Christmas, that we should make both ends meet in the June half year. We had the very respectable

balance of £55,400 to bring forward; and we thought we might have to dip into this to the extent of perhaps £10,000 or £15,000. Instead of that, we have a surplus of over £21,000; and this surplus, let me say, has not been obtained by "sweating" the concern at all. We have charged everything that is proper to be charged to revenue, and still we have this surplus after providing £7875 more in the shape of dividend—that is, part of it is on the increased capital, and part of it is due to the small increase of dividend. Well, finding this, to our great surprise and pleasure, the obvious course was to give our partners, the consumers, the benefit at once, and we have reduced the price of gas further by 1d. from Midsummer. I can only tell you it is a great satisfaction to the Directors to be able to do this. How it has come about we really hardly know. There has been an increase of 4 per cent. in consumption; and though that is not very much, still it is a very fair increase, and there has been a saving of £19,000 on coal compared with the corresponding half of last year. You remember the reduction of 2d. last Christmas took £50,000 off the half year; and we expected that we should get a saving on coal. We thought the £19,000 would go to enable us to meet the loss of £50,000. Then we have had rather better receipts from coke, tar, and ammonia than we anticipated; and we have produced and sold 200 cubic feet of gas more per ton. Well, that is one of the results of being free from the parliamentary restriction to supply gas of higher illuminating power than we can make from the obtainable supply of coal. We are now free to do the best we can to get the most we can out of the coal; and we have made and sold an additional 200 cubic feet. Then the only real reason that I can conceive for the extremely satisfactory working of the half year has been that all our people have been pulling together. I must say with regard to our chief officers, my friends on my left and right—Mr. Bush and our Chief Engineer, Mr. Carpenter—and the Engineers of the various stations, the officers working under Mr. Bush, and right away down from the heads to the workmen, that I feel we have had not merely their loyal but their very hearty and willing support, and constant efforts to do the best they can for the Company.

PROFIT-SHARING.

Now, I once met a great employer of labour, a gentleman at the head of one of the largest establishments in the North of England. My friend Mr. Ewart introduced me to him on Westminster Bridge. He tackled me with the profit-sharing, and said something to this effect: "Suppose you do not make profits, what then?" "Well," I said, "that is a difficulty, but I think our people earn the 5 per cent. that we are giving them;" and I put it to him: "Do not you think that employees, workmen, and others, who work in a cheerful and willing spirit, and are contented and happy in their work, are worth 5 per cent. more than the ordinary indifferent class of people?" He caught me up instantly. "Five per cent.," he said, "say 20 per cent." "No," I said, "I will not say 20 per cent. I do not think they would make that difference; but I am quite sure it makes a difference of more than 5 per cent." Further experience goes to prove that, if you can get the hearty and loyal co-operation of your people, you will do much better than if they are indifferent; and I am sorry to say that the existing wages system does not tend to get the best out of the men, and the same applies to the officers. But if you do something to create a downright interest in the business in which they are engaged, their hearts are in the work, and the result is shown in the balance-sheet.

THE DIVIDEND.

The next paragraph of the report relates to the dividend. I will not say much about that. The dividend we have paid hitherto has been 5½ per cent.—£5 6s. 8d. We propose now to divide 5½ per cent. We are entitled to £5 12s., but we have never divided so small an amount as 2s. Mr. Mews, however, will move the dividend resolution; and I do not wish to take out of his mouth anything he wishes to say.

INSURANCE AND RESERVE FUNDS.

Then there is the insurance fund; I might say a word about that. We have taken advantage of the surplus profits to add another £8000 to the insurance fund, making it rather over £100,000. I think that with an insurance fund of £100,000 we may be content; but I think I ought to explain what these funds are for. They are to meet any unavoidable or unexpected loss or accident. I can remember there was a very serious accident many years ago (forty years ago, was it not?), which resulted in the Wood Street fire. The Great Central Gas Company were laying on the service in a warehouse in Wood Street, Cheapside. Gas escaped from it and took fire; the premises were burned down; and the Company had to pay. The Gaslight and Coke Company had a somewhat similar accident at Savile House, Leicester Square, which was burnt down, and they had to pay; and the Liverpool Gas Company managed to burn the landing-stage, and they also had to pay. In each case, the amount was about £80,000, more or less. In 1889, we had a serious expense that came on the insurance fund, which then amounted to £40,000. Then came the strike; and we took from the fund £30,000 to meet the expenses of it. If the insurance fund then had amounted to £100,000, instead of taking £30,000 we should have taken £60,000; but what we did at the time of the strike (it cost us about £100,000) was to take £30,000 from the insurance fund, £30,000 from the shareholders, by reduced dividend, and the rest from the reserve fund. I think with an insurance fund of £100,000, we may consider ourselves safe. Our reserve fund, also, amounts to over £150,000, and we carry forward this £65,000; so that at the present moment we have larger reserve funds than the Company ever had before—over £300,000—to meet unforeseen contingencies.

THE CO-PARTNERSHIP QUESTION.

The only other matter in the report to which I have to allude is the question of co-partnership. In 1898, we introduced a scheme for the appointment of Employee Directors. It was an experiment—a pure experiment—and no one could say what would be the result. I thought it was worth a trial. It is the only time, the only occasion—and this is my twentieth year as Chairman—the only occasion on which there has ever been the slightest difference between me and some of my colleagues on the Board, and some of the shareholders. (Hear, hear.) I do not blame those gentlemen at all. I think they were perfectly right in taking a cautious view. It was an admitted experiment; and they were rather afraid that it would not result to the advantage of the Company. But I think the discussions were beneficial; and I am very glad they had the courage to express their opinions. Even so pronounced a friend of the working man as the late Mr. Mundella was doubtful of it. I consulted him on the matter, to get his opinion; I consulted several of the most prominent members of the Labour Commission—he was one of them—and he very frankly said to me: "I am not afraid of the workmen electing indifferent or inferior men; but what I am afraid of is that when they have elected their representative, he will take a narrow view of his duties, and, instead of taking the broad view that his duty is to look to the general interest of the whole concern—shareholders, consumers, and employees, all having to be treated with equal justice—he will take the narrow view that he has to look after the interests of one class only." Well, with an opinion of that sort, coming from such a man, one could not but feel there was a risk. However, I am happy to say the two Workmen Directors elected by the workmen are still sitting on the Board. They have retired three or four times; and their fellow-workmen have re-elected them time after time every other year. When we started in 1891, we then had two Workmen Directors for three years; and then in 1901 we had to adopt another scheme, because our scheme was only for three years, and if it failed it would lapse. In fact, it lapsed anyway. What we had to do, if the system was to be continued, was to get an entirely new scheme; and that was passed by the shareholders in 1901. In that scheme it was provided that it should be brought before them every three years—the new scheme being for nine years—it should be brought before them every three years to be reviewed. In 1901, the officers elected one of their number—the station clerk at Vauxhall, Mr. Drumgold; and since then we have had these three gentlemen sitting with us, and I can say that never have they taken a narrow view of their duties. They have been prepared to look at the business all round; and I think I may say we all appreciate the services they have rendered.

THE CO-PARTNERSHIP BONUS.

In paragraph 6 we speak about the large amount of the co-partnership bonus. Now, we do not wish to conceal anything from the shareholders. There was £34,000 distributed among our employees last July. Under the reduction in price, next July the amount to be distributed will be £40,000, which will be 9¾ per cent. of the salaries and wages. Now, that is a very large sum. If it is to come out of your pockets, you will naturally and rightly grumble and complain, because you will say justly and fairly: "You are paying your people the fair market rate of wages"—and that is proved by the fact that we can get good service; we can get plenty of the most capable men to serve us—"you are paying them the full market rate of wages; you are giving them certain other privileges also; and if you are to add to all that this £40,000 a year, we think you are not treating us fairly, if it comes out of our pockets." The consumers might make the same complaint. They might say: "The bonus would go a long way towards another reduction of 1d. per 1000 cubic feet; and if this money comes out of our pockets, we have ground of complaint." Well, neither the shareholders nor the consumers can prove that it does come out of their pockets - perhaps that would be a difficult matter. But we who are in the interior of the business feel that it does not in any way come out of the consumers' and shareholders' pockets. We feel that the whole of the money is earned. I do not say that all the co-partners earn their share; that I am not going to say, because there are some indifferent men among them. But I say that, by the good work shown by our people, and by the interest taken in the Company, the whole of the money is earned; and so long as it is earned, and so long as it is well and rightly used, I think there will be no cause of complaint on the part of anyone. All that we ask of our employees—and it is a great thing to ask, but it is what we have a right to ask—is the signal put up by Nelson on Trafalgar Day: "England expects that every man this day will do his duty." We have the right to ask of all our employees that they will do their duty. So long as they do their duty, that is all we expect of them. Let them put their hearts into it; and when they do it in that way, and do it in that spirit, we are certain the money that is paid on this co-partnership principle will be earned.

CONCLUDING OBSERVATIONS—NO RESTRICTIONS.

I close as I began. What we want is freedom to do the best we can for our consumers. The sliding-scale protects them. We have no longer a monopoly. There are various other artificial lights in active competition with us which at the time the restrictions I have referred to were first imposed were not in existence. There was no cheap mineral oil, and there was no electric lighting. Now we are in active competition with both; and what we ask and what we desire is freedom from needless restrictions. Surely, in every trade the utmost freedom, consistently with the public interest, is the ideal for trade of all kinds. In our case we ask for that freedom; and I think we have a right to ask for it. The greater freedom that can be given to trade, the better. There should be no restrictions of trade but such as are absolutely necessary; and where they are necessary, they are simply necessary evils which we must put up with. But we are on the eve, I believe, of greater freedom for the gas industry; and I think it will be the starting-point for a great increase in its prosperity. I have great pleasure in moving the adoption of the report.

THE VALUE OF THE WORKMEN DIRECTORS.

Mr. JOHN EWART: I have great pleasure also in seconding the adoption of the report and accounts, because it is the best report we have ever presented to the shareholders, and ought to be thoroughly satisfactory to all the members of the co-partnership—to the shareholders, for they are receiving a higher dividend for the present half year than they have ever done before, and they have also the increase of dividend in sight; to the consumers, because they have received a reduction in the price of gas in the last half year, and are now enjoying another reduction, and are burning gas at the lowest price it has ever been sold at in London; and to the employees also, for they are receiving a higher bonus than they have had before, and will also receive a

still higher one in the course of the present year. They have also the satisfaction of knowing that a good deal of the prosperity of the Company, among other contributing causes, is due to the excellent way in which they have—most of them, at any rate—co-operated in putting in the best of their brain power and muscle into their work, and doing their service with good will. There is no question that the co-partnership scheme has succeeded beyond the anticipations of any of us, even of the chief promoter of it, Sir George Livesey; and the employees, I think, have also to be congratulated on the excellent choice that they have made, and renewed from time to time, in the election of Messrs. Austin and Butcher as the representatives of the men, and of Mr. Drumgold of the officers, on the Board. I was one of those to whom the Chairman has referred, who took rather an active part in opposing this part of the scheme; for, in common with some other members of the Board and a good many of the shareholders, I had considerable misgivings as to whether the Directors elected by a section or sections of the shareholders would not feel that they were entirely representative of them, and would not work for the common good. I am pleased to say that, as the Chairman has pointed out, these views have been falsified, and our colleagues have taken a much broader view of their duties and responsibilities. I am sure it is to the great advantage of the Company that they are with us.

The motion was carried unanimously.

THE DIVIDEND.

Mr. JOHN MEWS proposed: "That a dividend at the rate of 5½ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." He remarked that, as the shareholders had heard, they were entitled, under the sliding-scale, to pay at the rate of £5 12s. per cent. per annum; but as they did not wish to divide the whole, it was proposed that the dividend should be limited to £5 10s. per cent., and that the balance of 2s. should be carried forward, as indicated in the report. At no period of the Company's history had so high a dividend as this been paid—the highest dividend previously having been £5 6s. 8d.; and this observation applied not only to the time since the amalgamation of the "A," "B," and "C" stocks, upon which varying amounts of dividend were payable, but even to the days of the "A," "B," and "C" stocks representing, he believed, the South Metropolitan gas stock, the Phœnix, and the Woolwich Gas Companies or the Surrey Consumers Company. This being so, he thought the shareholders would agree with him that the state of things was very satisfactory. All they had to do in order to keep up the dividend—and it did not sound very much—was to keep the price of gas down to 2s. 1d. per 1000 cubic feet.

The CHAIRMAN: 2s.

Mr. MEWS: 2s. 1d. if the present dividend is to be paid; and as the price is down to 2s. now, we may be entitled to more later on. In addition to that I am sure the Board will never agree to distribute dividend until it has been properly earned. In this case I can assure you that we have earned the dividend; and therefore I have much pleasure in moving the resolution.

Mr. H. AUSTIN (a Workman Director), in seconding the motion, said that, after hearing the Chairman's speech with reference to the co-partnership scheme, he was sure the employees would feel pleased at having elected members to the Board who had in some measure contributed to the attainment of the present position, and many of them would go away highly pleased with the compliment paid to them by the Chairman. They would all do their level-best to continue the success of the Company; believing that this was one of the best schemes ever initiated for bringing together the workman and the employer. Nothing had contributed more to raising a higher ideal in the bosom of the workman, and making him feel that he had something to live and work for, coupled with the certainty that in his old age there would be something to keep him from the workhouse.

The motion was carried unanimously.

THE SHAREHOLDERS' THANKS.

Dr. DRYSDALE proposed—"That the thanks of the meeting be given to the Directors for the able manner in which they have conducted the affairs of the Company." He said they were now witnessing one of the greatest experiments that had ever been made in social economy in this country; and most satisfactory it had proved to be. In modern society, there were only two classes, employers and employed, whatever number of classes there might be in Hindustan and other countries; and it was evident that in future the position of the working classes would be very much altered. John Stuart Mill, the greatest economist that ever lived, said that in the House of Commons there should be an equal number of employers of labour and of workpeople. He did not know whether the Chairman would agree with that.

The CHAIRMAN: Not at present.

Dr. DRYSDALE said no doubt it would be so eventually. Here there were already three employed men out of ten Directors; so that the Company were getting on in the direction Mill indicated. He had listened with the greatest pleasure to the Chairman's speech, and was glad to find that the workmen had no less than £225,000 invested in this splendid undertaking. This was far better than co-operative shopkeeping, for he had noticed that shopkeepers of this class gave their workpeople no share whatever in the profits. This was a serious blot upon the system; and he hoped the Chairman would have the kindness to indoctrinate the co-operators with something better.

Mr. STOCK said he had much pleasure in seconding the resolution. There was no doubt that the Chairman's speech had given great satisfaction to everybody present. It was very rarely he had attended a meeting where some question had not been put to the Chairman or Directors as to what had taken place during the half year; but the speeches of the Chairman and Mr. Mews, recommending a dividend at a higher rate than it had ever been, seemed to have quieted people.

The resolution was carried unanimously.

The CHAIRMAN: I thank you and the meeting very heartily for this very kind vote. I confess I felt a little disappointed when there were no questions asked, because the questions put at our meeting are always put in such a friendly spirit that there is no feeling of antagonism, and one rather enjoys them. However, I quite appreciate what Mr. Stock said—that the fact that no questions were asked is the best evidence that the shareholders are satisfied that we the Directors are doing the best we can for the promotion of the interests of the Company. Ours is a true co-partnership; we are three partners. In the co-operation that Dr. Drysdale refers to they have only two partners, the seller and the buyer. They do not include the worker, and there, I think, they are much mistaken. Efforts are being made, I know, to induce them to include the three. The sliding-scale as originally proposed identified the interests of the shareholder and the consumer, making those interests identical—making it the interest of the shareholder to do the best for the consumer. Now, we have got the third partner; and a three-fold cord is not easily broken. I thank you again on behalf of my colleagues and myself for this very kind vote. We are all working together. There is one other thing I have to say. I have to propose a vote of thanks to our officers, as representing the staff and the employees generally. I have already alluded to my friend the Secretary and to Mr. Carpenter, the Chief Engineer; and I need not repeat what I have said. They are first-class officers; they are thoroughly devoted to the Company; and they have imbued those under them with their own spirit. I have therefore the greatest pleasure in proposing that the best thanks of this meeting be given to our officers and staff of workmen for the interest they have taken in the Company.

Mr. GEORGE HOWLETT, in seconding the resolution, remarked that we live to-day in a record-breaking age, and an epoch-making age; and this Company had achieved both. He had been mixed up with the Company more or less for forty years, and knew something of its inner working, its past history, and its present condition. The existing state of things had not been brought about easily, but by a good deal of hard and strenuous work. In such a matter, there must be a leader; and this Company had one of the most extraordinary leaders of men of this sort the country had ever seen, who started with the magnificent advantage of knowing his business. Sir George was "to the manner born"—and, in fact, he thought he was born in a gas-works.

The CHAIRMAN: Not quite.

Mr. HOWLETT: Or very close to it. At any rate, he had been connected with gas-works all his life, and had probably spent more time in gas-works than in his own bed. After working here as a servant and as an officer, and after having achieved a fair competency, what most men would have done would have been to retire to a well-earned rest. But Sir George worked as hard to-day as he did when he was Chief Engineer and Secretary of the Company. Sir George had been the leader; the officers and staff had been his helpmates. In their Chief Engineer, they had one of the most remarkable men in the country. (Hear, hear.) Young in mind, he was as brilliant a man as there was in the profession, giving his whole life, his time, and his talents in the interests of the Company. With his assistance at the works, with such a pattern and such an example, good work must necessarily follow. In Mr. Bush, they had a pattern Secretary, with a loyal staff behind him, never growling at the work they had to do, but readily doing it and doing it well. The present price of their gas was a record in London; and the Company was an object lesson to the whole of the country, of an economically worked concern, with a competent and satisfied body of workmen. With such a cohesive partnership as there was in the South Metropolitan, there need be no finality. It had been the dream of the Chairman's life to see gas at 2s. per 1000 cubic feet; and he supposed he would continue working until he got the price down to 1s. 6d. There was no impossibility about that; and he believed the Company's system had been so thoroughly built up by the officers that when God should take away Sir George Livesey, the work of co-partnership would continue, and have a lasting effect upon the industry and commerce of England.

A SHAREHOLDER, in supporting the resolution, said this was the first time he had had the opportunity of attending one of the meetings; and he was very pleased to hear so favourable a report. He was a new shareholder in the Company, and had been watching for many years the progress of the Gas Companies in South London, even from the starting of the Phœnix Gas Company at Bankside. It so happened that in his younger days he was living at Bankside; and the site of the very house in which he lived was now the office of the South Metropolitan Company. From what he had heard, he was inclined to take a little more interest in the Company than he had hitherto taken.

The CHAIRMAN, in putting the resolution, said he supposed the last speaker was one of the new shareholders who had come in with the latest issue of shares to consumers. He had also to say that the Deputy-Chairman had written expressing regret at his being unable to attend the meeting. In this, all his colleagues shared.

The resolution was carried unanimously.

Mr. CHARLES CARPENTER, on behalf of the staff, thanked the shareholders very earnestly for the kind manner in which they had received the resolution. It had been stated that this was an epoch-making year in the sense that the dividend declared was the highest the Company had yet paid, and the price of the gas was at the lowest. He might add that the amount of gas that had been produced per ton of coal was also the highest in the history of the Company; and he was quite sure that this satisfactory state of affairs would never have come about unless they had had the loyal co-operation of the staff, as he was pleased and proud to be able to say they thoroughly had.

The CHAIRMAN: The staff will include all.

Mr. CARPENTER said that was so. He was speaking particularly of the carbonizing staff, though that was only one branch; but the same remarks applied with equal force to the whole of the staff in the employ of the Company. The operations of gas manufacture were highly technical, and to some extent chemical; and they were very different from the manufacture of bricks or boxes, or other articles of a uniform character. The successful conduct of a business such as gas-making depended very much on the personal endeavours of the workmen themselves. There was no method of gauging the amount of their output. One had to rely on their co-operation in working; and the one reason, he thought, why co-operation had been such a remarkable success was that it created an interest in the Company. With regard to the personal remarks Mr. Howlett had been so good as to make, he

could only say that in his humble way he had endeavoured to follow as far as possible the great and noble example of their Chairman.

Mr. BUSH also acknowledged the vote. He said he must specially thank the Chairman for the kind and encouraging remarks he had made in regard to the officers and the workmen; and he assured him that they were thoroughly appreciated by all—workmen as well as officers, for they were all in the same boat. There were one or two remarks which he wished to make respecting the accounts. It might be asked: "How long will the amount figure in the cash account for the purchase of land?" There was a large amount of nearly £44,000 this half year, and a considerable sum had appeared in previous half years. This money was principally being paid for the acquisition of the site at East Greenwich. He was happy to tell the shareholders that there were now only two claims outstanding, and these would, he believed, be settled during the present half year. He was also happy to say that the Directors had up to now been able to settle all these claims amicably; and he had no doubt that the same result would be arrived at with the remaining two. There was one other item (in the revenue account) to which he wished to refer—"Slot meter collectors, £6116." More than £12,000 a year was being paid to slot meter collectors, of whom the Company had 116; and he was pleased to say that all these men had been appointed from the Company's own workpeople from different grades—stokers, carpenters, blacksmiths, fitters, lamplighters, and labourers. But the point he wished to bring to the shareholders' notice was this—that the 116 men held, in the aggregate, upwards of £5000 of stock, or an average of nearly £45 each. He was quite sure that these men, holding this stock, were the right sort of men to be employed by the Company, and that they would carry out their work satisfactorily. There was just one other item. In the general balance-sheet they would see: "Balance for hire-purchase fittings," nearly £13,000. He was happy to say that this amount had nearly doubled in twelve months, and represented numbers of consumers who had purchased from the Company, on the three years system, lamps both for outside and inside lighting and fittings for their houses. Personally, he should be very glad indeed to see this amount swell to £50,000, as if people bought their own fittings in this way it suited them to do so; and it also suited the Company, for he was quite sure they were going to add to the revenue.

The proceedings then terminated.

SHEFFIELD UNITED GAS COMPANY.

Half-Yearly Report and Accounts.

Though there was an increase of 19,725,000 cubic feet, or 1·49 per cent., in the quantity of gas sold in Sheffield in the six months ending June 30, the receipts were £15,827 less, owing to the reduction in price, which from Jan. 1 to March 31 was 4d. per 1000 cubic feet, and from April 1 to June 30 2d. per 1000 cubic feet, less than in the corresponding period of last year. The Directors, however, in the report they will present to the shareholders at the half-yearly meeting on Sept. 6, say they regard the results of the half-year's working as very satisfactory, as, notwithstanding the reduction above referred to, the full amount required for the dividend has been earned, and there is a balance of £2170 14s. 9d. to be added to the amount carried forward from previous half years. The revenue from the sale of gas was £104,111; of residuals, £63,240; and the total receipts were £176,113. The expenditure on the manufacture of gas was £97,409; on distribution, £15,443; and on management, £5910—the total expenses being £130,882. The amount to be carried to the profit and loss account is £45,231; and the balance of net profit, subject to the half-year's dividends, is £103,591. These will come to £43,424. The construction of the new gasholder tank at Neepsend is proceeding satisfactorily; and the contract for the holder, which will have a capacity of 7,800,000 cubic feet, has already been let.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ended June 30, which, with the accounts, will be presented at the meeting of the proprietors on Thursday.

The Directors submit the accounts for the half year ended June 30, 1904. The revenue account shows a net profit for the half year of £60,434, which, added to the balance of £21,830 12s. 11d. brought forward from last year, produces a net revenue balance of £82,264 18s. 1d. Deducting therefrom £8398 1s. 4d. for interest, there remains standing to the credit of the net revenue account a balance of £73,866 16s. 9d. available for dividend. The Directors recommend the payment of dividends thereout at the rates of £5 4s. per cent. per annum upon the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. To meet the requirements of the Company, further capital is necessary; and a resolution will be submitted to the proprietors authorizing the raising of further capital, in conformity with the Company's Act of 1902, as and when the Directors may deem advisable. The Directors have reduced the price of gas from 2s. 6d. to 2s. 5d. per 1000 cubic feet as from the taking of the Midsummer indices.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 30th of June amounted to £858,125; that £1,076,875 had been added on conversion, making £1,935,000; and that £300,000 was unissued out of the £2,235,000 authorized (including premiums). The total amount borrowed on the above-named date was £314,062 10s., and £135,937 10s. was added on conversion; making a total of £450,000, and leaving £100,000 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,434,589 7s. 11d.; the expenditure stands at £1,260,346 5s. 9d., with a nominal amount of £1,212,812 10s. added on conversion—together, £2,473,158 15s. 9d. There is consequently a balance of £38,569 7s. 10d. carried to the balance-sheet. The expenditure on capital account in the half year was £29,187 19s. 6d.; the largest items being £5339 for new and additional stoves, and £15,885 for prepayment meters and fittings. There was also a sum of £3335 spent for new and additional steamships. The reserve fund amounted on June 30 to £31,085, and the insurance fund to £29,923. The following is the revenue account:—

REVENUE ACCOUNT.

Expenditure.

Manufacture of gas—		
Coals and oil, including dues, carriage, unloading, and trimming	£82,586 6 5	
Salaries of Engineer and officers at works	1,650 0 0	
Wages (carbonizing)	18,370 10 11	
Purification—including £2500 7s. 6d. for labour	4,945 14 10	
Repair and maintenance of works and plant, materials, and labour, less £132 8s. 3d. received for old materials	28,839 16 7	
		£136,392 8 9
Profit sharing		2,454 11 0
Distribution of gas—		
Salaries and wages of officers and rental clerks	£2,882 1 11	
Repair, maintenance, and renewal of mains and services, material, and labour	4,336 16 5	
Repair and renewal of meters	1,795 17 0	
" " " " stoves	4,060 2 2	
" " " " prepayment meters and fittings	4,601 3 0	
Incandescent mantle maintenance	1,286 11 2	
		18,962 11 8
Public lamps—lighting and repairing		3,359 17 6
Rent, rates, and taxes		9,940 6 4
Management—		
Directors' allowance	£1,250 0 0	
Company's Auditors	75 0 0	
Salaries of Secretary, Accountant, and clerks	1,097 0 8	
Collectors' salaries and commission	1,625 4 2	
Prepayment meter collection	1,096 6 3	
Stationery and printing	948 13 5	
General charges	1,138 14 2	
		7,230 18 8
Bad debts		938 9 1
Law and parliamentary charges		1,084 4 1
Superannuations and allowances		1,547 10 2
Official officers		112 1 3
Total expenditure		£182,022 18 6
Balance carried to net revenue account		60,434 5 2
		£242,457 3 8

Receipts.

Sale of gas—		
Common gas per meter at 2s. 6d. (55,722)	£173,477 2 5	
Public lighting and under contracts, common gas	7,324 16 10	
	£180,801 19 3	
Less discounts and allowances	3,519 14 10	
		£177,282 4 5
Rental—		
Meters (23,950)	£2,845 3 0	
Stoves (25,630)	4,339 18 2	
Prepayment meters (30,868)	6,071 5 5	
Incandescent mantle maintenance	600 2 6	
		13,856 9 1
Residual products—		
Coke, less £5245 16s. 9d. for labour	£32,805 5 8	
Breeze, less £683 9s. 2d. for labour	2,056 16 11	
Tar	5,799 19 2	
Ammoniacal liquor and sulphate of ammonia	10,455 15 10	
		51,117 17 7
Miscellaneous receipts—		
Rent receivable	£166 7 7	
Transfer fees	34 5 0	
		200 12 7
Total receipts		£242,457 3 8

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description.	In Store Dec. 31, 1903.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1904.
	Tons.	Tons. cwt.	Tons. cwt.	Tons. cwt.	Tons.
Common	22,258	115,906 12	105,465 2	681 10	32,018
Cannel	2,508	..	..	..	2,508
Total	24,766	115,906 12	105,465 2	681 10	34,526
Oil—gallons	228,354	1,076,581	1,172,851	..	132,084

Statement of Residual Products.

Description.	In Store Dec. 31, 1903.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1904.
Coke—tons	7,961	64,597	16,872	48,220	7,466
Breeze—tons	355	13,072	..	13,300	127
Tar—gallons	854,345	1,266,326	..	1,376,078	744,593
Ammoniacal liquor—butts	4,801	33 392	35,771	..	2,422
Sulphate of ammonia—tons	25	1,134	..	1,124	35

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,552,426	45,842	1,392,697	1,461,825	4205

CRYSTAL PALACE DISTRICT GAS COMPANY.

[NOW SOUTH SUBURBAN GAS COMPANY.]

The Ordinary Half-Yearly General Meeting of this Company was held at the Albion Tavern, Aldersgate Street, E.C., on Friday last—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice convening the meeting; and the seal of the Company having been affixed to the register of proprietors, the report and the accounts, for the six months ending the 30th of June, noticed last week, were presented.

The CHAIRMAN: Ladies and gentlemen, it is now my duty to move—"That the report of the Directors and the accounts be received, adopted, and the report entered upon the minutes." I make the motion; but before proceeding to deal more particularly with the report, I wish to supplement and enlarge or add to some remarks I made at another gas meeting this week on the subject of gas testing. Instead of making those remarks in the middle of my speech on the report I think it perhaps better to make them first.

GAS TESTING.

The subject of gas testing has been a sore point with gas companies for a good many years. Prior to 1860, there was none of it. There was competition among the gas companies, and that was considered sufficient protection for the public; but in 1860 the Metropolis Gas Act ended competition, and introduced the system of testing gas—the penalty testing of it. One complaint I have to make about this penalty testing is that it seems to me an unfair thing to the gas industry to be singled out for this purpose. There is no penalty testing of water; and it is a far more important matter that water should be pure. In 1853 an outbreak of cholera was traced to the supply of water by one of the London Companies; and it was conclusively proved that the water supplied by them, which was taken from the Thames, was the cause of it in their district. We know that enteric fever comes from impure water. Although the water supplied by the Companies has been tested, there has been no penalty attaching to it. There is no testing at all in the case of electricity—in fact, water companies, electric light companies, and other companies have privileges granted to them by Parliament to open the streets; and they are not under the onerous conditions to which gas companies are subject. Parliament, having given gas companies the right to open the streets, makes it a condition that all who require gas shall be supplied. But the same thing applies to those other companies; and conditions as to testing are not insisted upon in their case. The effect of penalty testing is to create a false and bad impression in regard to the gas companies. The natural inference is: "Oh, if these people have been selected especially as needing looking after in this way, it must mean that they are dishonest, that their practices and their tendencies are such that they cannot be trusted unless they have before them the constant fear of the Police Court." Now, circumstances happened to this Company some few years ago. There was a deficiency test reported by one of the Local Authorities; and it was found that there was a defect in the testing apparatus. We got Mr. Sugg and another eminent man to examine the apparatus and attend before the Magistrates, and these gentlemen proved that there was this defect in the apparatus—a defect that might easily have been seen by the tester, but he did not happen to notice it. There was no defect in the quality of the gas; and it was only apparent because the apparatus was wrong. The Magistrate convicted us. We appealed to Quarter Sessions, and we got no farther by it. This, I believe, is due to the prejudice which exists against gas companies, owing to the penalty testing clause. Well, I protest against it. I know something of the working of gas companies, and I am prepared to say that their business is conducted honestly. The officers of the companies, who really conduct the business, have no inducement to act otherwise than honestly. You can understand a man acting dishonestly if he has an interest in being a rogue, where there may be some temptation, but not where the officers have no interest whatever. Their interest rather is to satisfy the consumers, and thus to save themselves trouble. The less satisfaction the officers of a gas company give to consumers, the more trouble they give to themselves, because customers complain; therefore it is to the interest of the officers to act honestly, fairly, and straightforwardly.

FREEDOM IN SIGHT.

Now we have freedom in sight. This Company have taken a prominent part in endeavouring to secure freedom in one particular matter as to some absurd requirements in connection with the purity of gas. We have tried two years in succession to get parliamentary authority for relief from the necessity of using lime for purification, whereby certain sulphur compounds, infinitesimal in amount, can be reduced in quantity—they cannot be removed. Two years ago we went to Parliament, and we produced evidence that convinced a very able Committee of the House of Commons that we were right; and the Committee gave us all we asked for. We showed that the restrictions as to the sulphur compounds applied only to about 7 per cent. of the gas undertakings in the kingdom; that the corporations which supply gas are under no such restrictions, except about two of them, and they ignore them; but that the London Gas Companies, and a number of the Suburban Companies, were under these restrictions. The Local Authorities opposed us in the House of Lords. They frightened the Committee of that House, who said these questions were going to be considered by the Board of Trade; and our Bill was thrown out—£5000 at least being lost. This loss prevented us from making a reduction of 1d. per 1000 cubic feet in the price of gas; so that it was a loss to the consumers, and indirectly a loss to the shareholders and employees, because if we can reduce the price of gas 1d. per 1000 cubic feet it will give £5000 to the consumer, a slightly increased dividend to the shareholders, and a larger bonus to the employees. *If there is to be penalty testing of the gas of England, the conditions ought to be such that honest men can comply with them without difficulty and without anxiety.* They have not been so. Testing was a constant source of difficulty and anxiety, and we never knew where we were. With regard to sulphur compounds, our Engineer (Mr. Shoubridge) never knew where he was. He thought he was all right, and yet he might be all wrong. It is a false and cruel position in which to place honest men. The Board of Trade Committee have now reported emphatically that there is no necessity to reduce the sulphur compounds in amount, and that the presence of sulphur is no injury to the public. It appears that a chemist found them out by investigation some fifty years ago, and they have been testing everything but the right thing. They have been testing the gas to find how many parts there were in 100 cubic feet; they have even been testing the corrosion on the gas-fittings. The gas might be burning in the chandelier, and there might be a deposit on the fittings that was scraped off and found to contain some sulphur. Then they took the glass bell over the burner, and found sulphur there; and they even found sulphur in the leather of the bookbindings, which in some cases at least had been put in by the tanner. But they never thought of testing the air of the room, which is the right thing; and, as a consequence, they have been assuming that there is so much sulphur in the air of the room when it is proved now that it cannot be found. Only one-twentieth part of what there was supposed to be in the air of the room can be found. The Committee, as I say, have reported emphatically, and the money which we spent in promoting the two Bills this year and last, is all wasted, as they were simply waiting for the Committee, who came to the conclusion which we arrived at some time ago.

PROPOSED TESTING FOR CALORIFIC POWER.

The Committee recommend that experimental tests shall be made of the calorific power of gas. It is argued that we must have tests of some sort, and that the gas ought to have so much calorific power. Of course, it means penalty tests ultimately. This we must not submit to. Our fetters, we feel sure, will be removed; and now to allow ourselves to be fettered again by calorific tests would be the height of folly. Moreover, no one can tell what is the best heating power of gas. It is in competition with all other fuels. We have no monopoly of the supply of fuel. All we can do is to supply a gaseous fuel which will suit the public. If it suits their purpose, they will use it; if it does not, they will not use it. To submit to calorific tests would be jumping out of the frying-pan into the fire. We should deserve all we got if we submitted to it.

THE COMPANY'S BILL.

The Bill we promoted in the present session was opposed as usual; and it was emasculated. The clause which would have enabled us to reduce the illuminating power by supplying gas which could be obtained from the available supply of coal was struck out. The clause enabling us to purify by lime was struck out at the request of the Board of Trade. But we thought it well to let the Bill go on, because there were certain useful clauses, about which there was no contention. One is to calculate the sliding-scale half-yearly instead of annually. If we reduce the price in the half year, we cannot get the additional dividend to which we are entitled on account of the reduction until the whole year is completed, because the Act says; "If in any year" the price is so much. In the new Act it is altered to: "If in any half year." That is useful. The next clause related to the change in name; but we should not have gone on with the Bill simply for that. The objection to the old name was that people would not give us our correct name—the Crystal Palace District Gas Company. They always called us the Crystal Palace Company, and our name was altered as from the 1st of August. Another important clause was to enable us to offer stock in the first instance to consumers at the market price. Hitherto we have been obliged to offer it first by auction or tender; and, if not sold, we could then offer it to the consumers. We asked for power to offer it to them in the first instance, because we wish to make our consumers our friends. We want them to be not merely consumers, but to be interested in us as shareholders. Another thing is that it enables us to offer the stock in small amounts of (say) £5, £10, or £20; and it gives the small people the opportunity of making a safe and useful investment; and in that sense it is a benefit to the community. Henceforth, then, the Company will offer all its stock in the first instance to the consumers at as near as may be the market price of the day. The other part of the Bill is to give power to the Directors, with the consent of the shareholders and the Board of Trade, to formulate a scheme for the election of Employee Directors. As I shall have to deal with that later on, I will say nothing further about it now. The Act enables employees having stock or money on deposit, not exceeding £100, to nominate any person to receive it. That is to relieve them of the difficulty or the expense of making a will, or their successors the trouble of taking out letters of administration for amounts up to £100.

THE SUBJECTS IN THE REPORT.

I need not go to any extent into the second paragraph of the report, about the Departmental Committee of the Board of Trade, because my first remarks cover it. They say "that the nuisance which is occasioned by the use of lime for extracting these sulphur products is very serious, not only by reason of the annoyance caused to the neighbourhood, but also by the deleterious effect on the workmen employed in connection with the process." The sulphur products referred to are, in the opinion of the Committee, not detrimental to the public. Then we say in the third paragraph that there are no known means of removing sulphur compounds. While upon this point, I may say that the Company have taken a very unusual step in reference to this matter. We have had constant complaints. We have been prosecuted in the Police Court for a nuisance caused by the manufacture of gas; the nuisance resulting from the foul lime, on its being

taken from the purifier, which was used for reducing the sulphur compounds. The neighbourhood has grown very much since the Company was established—the works now have houses on three sides; and there is no doubt that a disagreeable effluvium does arise from the process of lime purification. We have tried for two years in succession to get relief. Mr. Gladstone used a remarkable expression when he said: "The resources of civilization are not exhausted." We think we have exhausted the resources of civilization. We have gone to Parliament for two years in succession; and twenty-five years ago we attempted to get the same relief, and failed. Now that the "resources of civilization" are exhausted, we must fall back upon others. The resources of barbarism are the ultimate resort. Take war, for instance. When the resources of diplomacy are exhausted, then they have to fight it out. I do not think we shall have to do this; but we have taken the bull by the horns. We say we cannot conduct our business without creating a nuisance. Parliament says: "You shall not create a nuisance." Yet Parliament says, "You shall reduce your sulphur compounds;" and, in doing this, we must create a nuisance. We are called upon like the Israelites in Egypt to make bricks without straw; we are not to use lime, because it causes nuisance; and we are not to send out gas with sulphur compounds, but we must use lime to reduce them.

THE QUESTION OF ENRICHMENT.

Then there is another thing we are doing. We have been required by Parliament, at the instigation of the local authorities, who do not know anything about it, for they always oppose a gas company blindly—somehow or other opposition is always offered to gas companies—and they do not know what the consumers want; but they have required the companies to supply gas of higher illuminating power than can be obtained from the coal. We have been obliged to adopt methods of enrichment. First we used cannel; but this was found to be too dear, as it cost the consumers £10,000 a year to enrich gas only one candle. Then petroleum spirit was found to be unsatisfactory. There is a method of enriching gas by carburetted water gas, which is cheap and practicable. Here again we have met with much difficulty. We put up the plant, and it has been a source of trouble ever since it has been there. First, there was a nuisance caused by partly burned oil, and now by an escape of tar into a brook, for which we have been prosecuted; and the Directors thought fit to take the bull by the horns and stop that ground of complaint by ceasing the manufacture of water gas. But to do this we must reduce the quality of our gas below what Parliament requires us to give, as we cannot supply 15-candle gas from the available supply of coal. All we say about water gas is that we find it not to the advantage of our consumers to use it, particularly for gas-stoves and fires. When you consider the large proportion of gas used for these purposes, it becomes a very important consideration; our gas stoves and fires are made for the use of coal gas. They are fitted with bunsen burners, which are adjusted to a certain supply of air—the quantity of air required for the combustion of coal gas. If you mix it with water gas, you get a gas of a different specific gravity, and the supply of air is not correct for it; the result being that it gets too much air, and the efficiency of the gas stoves and fires is seriously impaired. We have said this in the circular which we issued; and it is a remarkable thing that the consumers have made scarcely any objection to it. The only objection we have received is from a gentleman who is a shareholder, consumer, and an engineer; and he says: "I suppose the action of the Company is bound to lead to reprisals by the local authorities and possibly by the consumers." In one letter which we have received, the writer says: "I quite appreciate the efforts which the Directors are making, and I think they are taking the right course, and hope they will not be stupidly interfered with by the local authorities." Another writer says: "May I say you have solved in the best possible way the problem of two evils—chosen the lesser." One lady writes to say that the quality of our gas is execrable; but it has always been so since 1877, so she supposes it cannot be any worse. An engineer, consumer, and shareholder says: "In my humble opinion, the course you take is full of danger." If men hesitated to take a course because it appeared full of danger, there would be very little done in this world. If we were afraid to take action when necessity requires because there was some danger about it, there would be no progress. The main objection has come from the people who make water gas in other parts of the country; and I have had a letter from an old friend calling me to account in the most extraordinary manner, to which I shall make no reply. I drafted the circular, it is true; but it was adopted by the Board, who thoroughly considered it and altered it. This is a free country; and we have a right to tell our customers what we find is the difficulty—we have nothing to do with other people. The fact is I am rather inclined to think they know that what we think of water gas is true. The late Mr. John B. Gough, the great temperance orator, when he came over to England told some very funny stories; and one of his stories was this: A man came home one day very much upset. His wife said: "What is the matter, John?" He replied: "So and so has called me a liar." She retorted: "You need not trouble about that; you know he cannot prove it." To which the husband replied: "The worst of it is he has proved it." I think what we say about water gas is very much like this. These people would not be so much upset if what we said to our customers was not true. I leave it there. We shall do the best we can for our consumers. I believe the moderate statement in the circular to be true. In order to put the thing right with the consumers, the Engineer estimates that we shall save ½d. per 1000 cubic feet—equal to £2500 a year. To be perfectly safe, we make the consumers a reduction of 1d. per 1000 cubic feet, which will give them £5000 a year, and we undertake, for the next year at any rate, that we will not divide among the shareholders the £719 to which they would be entitled through the reduction. While upon this subject, I may say this: We ask that the experiment may be tried. We believe that it will be found satisfactory by the consumers; and if it is, surely the Local Authorities have no ground of complaint. The natural and proper course would be, after the experiment is tried, to go to Parliament to get the thing sanctioned and put on a proper footing; and I think the Board will promote a Bill next session. But we will not submit to the factious opposition of Local Authorities. We are willing and wish to meet them in everything that is reasonable; but if they offer the same factious and unreasonable opposition they have done before, we will withdraw the Bill, and go on without it.

REDUCTION IN THE PRICE OF GAS.

The last thing I have to mention is the price of gas. This was reduced from 2s. 7d. to 2s. 6d. last Christmas, which entitles us to an increase of 2s. 6d. in dividend. We were entitled to £5 7s. 6d.; but this being an awkward amount to divide, we have paid £5 6s. 8d. Now we are entitled to £5 10s.; and that is the dividend we recommend to you for the past half year.

THE INSURANCE FUND.

The only other remark I have to make is this: We are building up the insurance fund, which now amounts to close on £10,000. Out of the surplus brought forward, we have carried £2200 to the fund, making it £9793. I do not think £10,000 enough; and we may gradually increase the amount until it gets up to £20,000. A serious fire might be caused by the Company; and in that event it is much better to have funds in hand to meet the loss than cripple the dividend. With these remarks, I beg to move the resolution.

Mr. JABEZ LIGHT seconded the motion, and it was at once carried unanimously.

THE DIVIDEND.

Sir FORTESCUE FLANNERY, M.P., moved the declaration of dividends at the rates of 5 and 5½ per cent. per annum on the preference and ordinary stocks of the Company (less income-tax), for the half year ending the 30th of June. He said he should have confined himself to formally submitting the motion, had it not been for a remark which fell from the Chairman in the course of his speech—viz., with regard to lowering the illuminating power of the gas and abolishing purification from sulphur compounds, which had been the action of the Board, and not merely of the Chairman. He desired to endorse this statement, and to say that the responsibility for taking that course, in the interest of the consumers, the shareholders, and the public, was shared by every one of the Chairman's colleagues. The second remark he wished to make was that, while distributing the dividend recommended, he was sure all the shareholders contemplated with satisfaction the fact stated in the report, that an amount of £2500 had been divided among the employees under the co-partnership system. This was not money taken from the pockets of the consumers by charging them more for their gas, or from the pockets of the shareholders by a reduction of the dividend, but money raised by the greater energy, eagerness, and skill in co-operation displayed by the employees when they were put into the position of co-partners. The money was created by the extra exertions of the employees themselves, and he was sure the shareholders as well as the Directors most cheerfully desired to give them the benefit. It was, therefore, with special satisfaction that he moved the resolution.

Mr. CHARLES HUNT, in seconding the motion, associated himself entirely with the remarks made by Sir Fortescue Flannery in regard to the action of the Directors, as well as with the second part of his speech.

The motion was carried unanimously.

THE WORKMAN DIRECTOR QUESTION.

The CHAIRMAN: We now come to the special meeting, held in accordance with the advertisement. We explain something about it in the report; and I am very glad Sir Fortescue Flannery has mentioned the £2500, because it saves me the trouble of referring to it, as he put it so clearly. The employees have invested in the Company the large sum of £20,500, the greater part of it being in stock, though some is on deposit. Having embarked on this system, I believe—and the Board are with me here—it is the solution of the great question of Labour and Capital. It is the one means whereby their interests are identified, and they become friends and united, working together for the common good. The co-partnership system is simply an extension of the sliding scale to the employees. If the price of gas is reduced 1d., shareholders get an increase of dividend and the employees an increase, of 1 per cent. up to 5 per cent., on their wages and salaries, and with every further reduction of 1d., they get an increment of ½ per cent. We try to induce them to save the money. Half of it is withdrawable in cash, and the other half must be invested in the Company's stock; but I am pleased to tell you that the half which is withdrawable is nearly all saved. The men not only leave one-half in the stock, which they must do according to the conditions, but also put the other half in. They are showing their confidence in the Company by investing practically all their savings. Some of them draw out part to buy a house. There is a Building Society connected with the two Companies—the South Metropolitan and the South Suburban Companies—and some of the men use their savings to become purchasers of their own houses. This is very good, and it goes a long way; but it does not go the full length. Where people invest their money, they ought to have a voice in the management of the business. I go further than that, and say they ought to be made to feel the responsibility. A great many people do not like responsibility; but where your money is invested, and where your property is, you ought to know something of the responsibility of looking after it. The development we propose is that the employees should elect certain of their number to serve on the Board. That is a great innovation. The first I heard of it in this country was from a woollen manufacturer—Mr. George Thompson, of Huddersfield—who converted his business into a co-partnership. When the South Metropolitan did it six years ago, there was some fear that it would not work well. There was the fear that the workmen, if they elected one of their number, would feel that he was their delegate. We object to the word "delegate." He is their representative. A delegate means that he is to voice their wishes and nothing else; but when a man becomes a Director of the Company, he has to take a broader view. He has to consider three interests—those of the consumers, the shareholders, and the employees; and all are of equal importance, for no two could do without the other. What is the good of the consumers unless you have the money of the shareholders to make gas with? What is the good of shareholders and employees

unless you have persons to consume the gas? And what is the good of the shareholders and consumers unless you have someone to make the gas? Therefore we say the employees who have invested their property in this Company should have a share in the management. I believe they will select their best men; and from the experience we have had in the case of the other Company—the South Metropolitan—I think these men will take a broad view of their duties, and act for the general good. Our Act of Parliament gives us power to do this. It is in the hands of the Directors to bring the matter forward. The report has been circulated among the shareholders, and we quote from the Act of Parliament, section 5, that when the employees of the Company have £10,000 of stock—and they have a good deal more than this, for they have £16,000—the Directors of the Company "may, as and when they deem expedient, prepare a scheme for the purpose of enabling employees holding ordinary stock of the Company to elect one or more of their number, but not exceeding three, to be a Director or Directors of the Company. The number of Directors elected under the provisions of this section shall be in addition to the number of Directors of the Company." That is the first sub-section. The second is that the scheme shall be submitted to an extraordinary meeting of the Company to be considered by the shareholders. If they object, there is to be an end of it; but if they approve it, it will have to go to the Board of Trade for their sanction. If the Board disapprove of it, there is an end of it. But I know that they will not do so. We have been to them; and so you need not have any fear on that score. Then the scheme is to be published in the "London Gazette," and is to last for a period of three years. That is in order to provide against the possibility of failure. It is said: "If the scheme does not answer, you will have great difficulty in abolishing it." We therefore fix it for three years, and no longer. If it is a failure, it lapses; there is nothing more to be said. If it is not a failure, we shall have to come to the shareholders again to ask permission to extend it. The South Metropolitan Company did this; and the second time the period was made nine years. The scheme then goes on to say:—

> The qualification of an Employees' Director shall be fixed by the scheme for the time being, subject to the following limitations: The Employees' Director shall have been not less than seven years in the constant employ of the Company, and shall have held for not less than twelve months prior to the date of election, and shall continue to hold, not less than £100 nominal value of the ordinary stock of the Company.

That is, a man who has shown sufficient confidence in the Company to invest savings to the extent of £100, and has been for not less than seven years in the constant employ of the Company, is qualified as a Director. The fees to be paid are in proportion to the qualification. The qualification of an ordinary Director is £2000, and of an Employee Director £100. The next section provides for the method of voting. The Directors have resolved to promote this scheme, and in the first place to limit the number of Employee Directors to two. Clause 3 says:

> Employees in receipt of weekly wages shall have the power to elect one Director, and employees on the staff receiving salaries payable monthly shall have the power to elect one Director, or two in all. In the event of the staff not exercising their option, then the employees in the receipt of weekly wages may elect the two Directors.

Then there is a scale of voting. We do not allow any man to have a vote who has less than £10 in the Company. We repeat the qualification, and then there are clauses about the nomination of candidates and voting. Clause 8 specifies that one Director of the two elected under the scheme is to retire every year. The words "after the first Board meeting in the month of November" in the clause must come out. We did think of proceeding at once to an election; but there are not quite enough of our people who have the full qualification of £100 to get a satisfactory selection. We take power to put the scheme into operation when necessary; and very likely it will not be till next year. The time of election is to be fixed by the Board. As to fees, clause 10 says:

> The Employee Directors shall have their ordinary duties and the pay attaching thereto suspended during the time that is found to be necessary for their duties as Directors. The fees shall "bear some proportion to the amount of their qualification," relatively to those of ordinary Directors, which are equal to about one-sixth part of the nominal value of their qualification, and will accordingly be about £16 per annum. The fees for their service as Directors shall be the amount they would have earned if they had been at their ordinary employment, *plus* 12s. 6d. for each fortnightly attendance."

The word "fortnightly" ("fortnightly attendance") comes out. The South Metropolitan Company began with 10s. 6d. for each attendance, and by the second scheme it was increased to 21s. We think it would be fair to start at 12s. 6d., and therefore we propose it. Then it is provided that these regulations shall, as far as possible, apply to the staff. If any proprietor has a question to ask or any doubt about the scheme, I shall be very pleased to give any further information. I beg to move that the scheme be approved.

Mr. LIGHT seconded the motion, and it was carried unanimously.

The CHAIRMAN then proposed a vote of thanks to our officers, staff, and workmen, saying the Company were thoroughly well served by a devoted body of men. They had Mr. Shoubridge at the head of the manufacturing department, and Mr. Ohren at the head of the clerical department; and he was sure a great deal of the Company's prosperity was due to the experience of these gentlemen and their subordinates.

Mr. CHARLES HUNT seconded the motion, and it was carried unanimously.

Mr. SHOUBRIDGE, on behalf of the workmen and the engineering staff, thanked the proprietors for the kind recognition of their services expressed in the vote, as well as for the very handsome bonus they had received in connection with the co-partnership system. He also thanked them for the honour they had conferred upon the employees by granting them the privilege of electing representatives on the Board of Directors. He could only hope that the men selected would prove worthy of the trust reposed in them, and do good service to the Company.

Mr. OHREN returned thanks for the officers in his department.

The CHAIRMAN said he had a letter from Mr. Morton expressing regret that, being in Scotland, he could not attend the meeting.

A vote of thanks was accorded to the Chairman and Directors, and the proceedings closed.

BRISTOL GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Offices, Canons' Marsh, Bristol, last Thursday—Alderman J. W. S. DIX in the chair.

The report presented showed that the profit realized in the six months ending the 30th of June was £43,503. After paying £5512 for interest on debenture stock and £27,563 for dividend on the general capital stock, there was left a sum of £10,428, which made a total of £37,050 to the credit of next half-year's account. A dividend at the rate of 5 per cent. per annum on the nominal capital of the Company was recommended.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was a matter of congratulation to be able to put such a report before the proprietors. The dividend had not only been earned, but they had carried forward £10,428, which, with the previous amounts carried forward, made £37,050. They had written off £2000 on the investment account, which they had thought desirable because of the fall in the rate of interest on Consols, and had added £2500. So far as their business was concerned, he thought it was a very flourishing one. Their consumers for the present year had increased 3130 up to the 30th of June, and their slot-meter consumers 2118; making altogether a total of 45,248. There had been a satisfactory increase in stoves of 3940, and the total number in use was 25,324 up to the end of June; but a good many had been sent out since. They had laid during the year 6 miles of mains; and their total mileage at present was 346. So far as the price of gas was concerned, at the end of June it was altered, as they had reduced it to the ordinary consumer from 2s. 3d. to 2s. 2d. per 1000 cubic feet, and to large consumers to 1s. 11d. He might mention that 1d. per 1000 cubic feet meant £10,000 a year to the Company. In comparison with other gas companies, he thought theirs was a very low price. It had always been his dream and hope to see it reduced to 2s. to the ordinary consumer; and if business permitted, it was the intention of himself and his co-Directors to try to bring this about. It had been a matter of regret to some that they had not more central offices; but so long as they could carry on their business comfortably, and do it efficiently, they had not wished to put the Company to the expense of building new premises. But times had altered, and the railway had made things much more inconvenient than in the past. Then, again, show-rooms had been made use of by other gas companies; and the Directors felt that a central office would be a convenience to their customers. The site secured was that of the old Colston School. The buildings they proposed to put up would be an ornament to the city. They were going to have what no other gas company had, and that was a department where people could see how gas might be utilized to generate electricity, and learn how to light up their own premises by electricity produced by using a little gas. They also intended to have a cookery department, where ladies could see how to use the gas, and where lessons in cookery would be given. Notwithstanding the large employment of stoves, there were still a great many people who were prejudiced against cooking by gas; and it was to dispel this prejudice that the venture he had referred to was to be made.

The DEPUTY-CHAIRMAN (Mr. G. K. Stothert) seconded the motion, and it was carried.

A vote of thanks was accorded to the Chairman, and the meeting terminated.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors congratulate the proprietors on the continued satisfactory growth of the undertaking; the sales of gas showing an increase of 9·45 per cent. on those for the first half of last year. The Bill promoted by the Company received the Royal Assent on the 24th of June; and the concern will henceforth bear the shorter title of the "Croydon Gas Company." The price of gas in the Carshalton district having been reduced by 3d. per 1000 cubic feet from Michaelmas last, the rate of dividend the Company are entitled to pay on the Carshalton capital (the "C" stock) is increased under the sliding-scale. The period of ten years fixed by the Act of 1894 within which the price of gas in that area was to be not less than 6d. per 1000 cubic feet in excess of that in the Croydon district, expired on the 30th of June. A clause was inserted in the Company's Act of this year providing that the difference in price between the two districts should, from Midsummer, be reduced to 3d. per 1000 feet, and that not later than July 1, 1907, the price in the two areas should be uniform. With the view of encouraging the use of gas for motive power, the Directors have decided that from Michaelmas next an allowance of 3d. per 1000 cubic feet shall be made on gas so employed. They have also decided to allow discounts of from 2½ to 5 per cent. from the accounts of large consumers, according to the quantity used annually.

The accounts accompanying the report show that the revenue from the sale of gas in the six months ending the 30th of June was £64,216, compared with £59,192 in the corresponding period of last year; the rental of meters, stoves, and fittings produced £5829, against £5160; the sale of residuals brought in £19,787, against £17,700; and the total receipts were £89,915, compared with £82,131. The manufacture of gas cost £43,855; distribution, £12,375; and management, £2982—the total expenditure being £67,841, compared with £62,196. The balance carried to the net revenue account is now £22,073, against £19,935 this time last year; and the sum available for distribution is £23,018, compared with £18,084. The Directors recommend dividends at the rates of 14½, 11½, and 10 per cent. per annum on the three classes of stock, less income-tax. The payment of these will absorb £17,999, and leave £5019 to be carried forward. There were employed 31,839 tons of coal, 3 tons of cannel, and 439,584 gallons of oil, for a make of 502,776,000 cubic feet of gas, of which 464,889,900 cubic feet were sold and 470,732,100 cubic feet accounted for. The estimated quantities of

residual products were: Coke, 19,105 tons; breeze, 5685 tons; tar, 424,773 gallons; and ammoniacal liquor, 963,146 gallons. From the last-named product 344 tons of sulphate of ammonia were made.

BROMLEY GAS CONSUMERS' COMPANY.

Valuation of Gas-Works for Assessment.

The Ordinary Half-Yearly Meeting of this Company was held last Tuesday, at the Bell Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN said he thought it augured well for the stability and prosperity of the undertaking that they were continuing their progress steadily half year by half year—each time adding to the previous make of gas and the effective power and condition of the plant and the works. In the six months to June last, the increase in the make of gas was nearly 4,000,000 cubic feet, as compared with the first half of last year; and the yield per ton of coal carbonized was well maintained. They might perhaps have discovered in their examination of the statement of accounts that the total quantity of gas sold during the half year was 5,200,000 feet more than in the first half of 1903; and the unaccounted-for quantity was consequently reduced by 1,400,000 cubic feet. They would be also glad to learn that the automatic meter supplies, which were being still extended, had contributed 2,200,000 feet of this increase. Not only were they seeking to enlarge their field of operations in this respect; but in order that all their consumers might be able to utilize the lighting power of the gas more efficiently, and so more economically, the Company were offering them the advantage of having their burners periodically examined by some of the Company's competent workmen for the small—he might say nominal—quarterly charge of 3d. per burner; and, in addition, they were offering to supply new burners, when desired, at cost price. They had, further, pointed out for the information of those interested, that a modern incandescent gas-burner would give a light of from 18 to 24 candles per foot of gas consumed, and that with a pennyworth of gas at 3s. per 1000 cubic feet they could obtain a lighting power equal to 504 candles; whereas a pennyworth of electricity from a new electric glow lamp would only give, at 5d. per unit, lighting power equal to 50 candles. To a man who studied his own pocket, and the light he wanted and got, this comparison was ten to one in favour of the incandescent gas lighting system. While the inspection of the burners on the terms they were now offering to the consumers would not be directly remunerative in profit, but entail charges on their funds, they felt confident that the relative cheapness and general usefulness of gas for brilliant illumination would be thereby established, and that the additional facility it presented for cooking and heating purposes would, in that combination, ultimately secure for it the largest measure of public support. The next suggestion he had to make to them was that the financial position, upon the balance-sheet, was very reassuring. The capital expenditure had been relatively small, and probably would be for a time; the capacity of the plant being well ahead of to-day's requirements. The only additional work in hand at the present time was the erection of a cooling apparatus for better reducing the temperature of the gas after leaving the retorts. Its cost would be about £1800; and its provision was expected to be productive of advantages in other directions, which would render the outlay an economical one. But while this was so with new structural works, it must not be overlooked that in the matter of working capital money had also to be provided for the expenditure on meters, pipes, stoves, fittings, and the fixing of them, in connection with the automatic supplies. This was charged to a separate capital suspense account, and had already been a very considerable outlay. It was written down every half year; and it now stood in the balance-sheet at about £7500. Gas and meter rentals had increased by £589, although the price of gas in the first and heavier quarter to Lady-day was 1d. less than in the corresponding period of last year. Of coke, they had sold a larger quantity at a lower price; but it had yielded £293 more. Rental of stoves and fittings had, of course, grown with new business; but the slight advantages from sales of tar and breeze were, he thought, about set off by the rather lower price of sulphate of ammonia. The half-year's receipts amounted to £28,989, as against £28,063 last year. On the other side of the account, coals carbonized had cost £35 less; but this covered also an additional 455 tons included in that payment. Rates paid were £1178, against £760. The income-tax reserve was £118 more, as they now charged each half year with its own burden, instead of charging it yearly; and they had not in the past six months repeated the good fortune of last year in getting back a return of overcharges on disputed disallowances, for the best of all reasons—that none had recurred. These, and other fluctuations in service charges, made the total expenditure £20,941, as compared with £20,219 last year. The net revenue balance was £8047; and deducting interest on mortgages, debenture stock, and bankers' loans, there remained £7106, which permitted the payment of the same dividends as hitherto, and left £378 to be added to the balance of undivided profit, which would now amounted to £4236. It would be seen that the reserve fund stood at £7236. The Directors, during four years of as trying times as had ever fallen on gas directors, with dear fuel and dear money, had been applying their most careful discrimination, not only to maintain the unbroken sequence of the shareholders' income, but also for lessening the load upon Company and consumers consequent on the phenomenal increase in the cost of coal in the year 1900, when it appreciated to almost three times its previous value. Gradually—though not so quickly as they could have wished—the price of coal had been dropping. Just when they had got within 25 or 30 per cent. of the price at which it stood before the rise, and when they had restored the old price of gas, and strengthened the balance so as to be able to face the risks of charging a lower price for gas than had ever been previously adopted in the history of the Company, they were surprised by notice from the Assessment Committee of the Union that they, having appointed a new Valuer, had increased the rating of the Company by no less than 60 per cent. of the valuation settled by them and their Valuer five years previously. Needless to say, the Board protested strongly, and formally objected, with the best professional aid; but unfortunately with only this result—that the figures were reduced to an amount which would involve an increase of 40 per cent. upon the assessment of five years ago. According to this decision, the Company were called upon to pay additional rates to the extent of £700 a year, which was alone equivalent to between 1¾d. and 1¾d. per 1000 cubic feet upon all the metered gas sold. He did not propose to refer in detail to the differences of opinion between the Valuers on both sides; the matter being one in which the Company still had a right of appeal to Quarter Sessions. There was to have been a new Valuation Bill this year; but the measure had gone over to a future session. Whatever else might come of it, it was to be sincerely hoped that means would be devised for cheapening the cost of having to contest such assessments and methods of valuation. In the case of public companies, the methods of valuation were peculiarly technical, and required much study to be "apprehended of the common people." But perhaps the constitution of a special tribunal to hear such cases, which could deal speedily with the latest inventions of the most cogent calculator, without subjecting the appellants to cruel costs, might after all not entail that the last state of the companies would be worse than the first. Indeed, the more one saw of the rating of gas and other companies, when the profits above a certain standard reverted so largely to the public as consumers, the more one wondered why the method of rating upon a structural rent, as in the case of an ordinary trader, and quite apart from the profit made from the business carried on, should not equally apply to companies. In fact, the method now adopted took out of the concern in rates money which would otherwise, by statute, revert to the consumers in diminution of the price of gas. As he had mentioned, their Company were now saddled with extra rates equivalent to from 1¾d. to 1¾d. per 1000 cubic feet of gas sold; and had this exaction not been made, they would have been able to supply the consumers with gas at a reduction of 2d. per 1000 cubic feet. The new assessment operated from Lady-day until modified on appeal. The Directors were greatly disappointed; but under the circumstances of the moment, they felt that they had no alternative but to reduce the price by a single 1d.—that was, from 3s. to 2s. 11d.—as from Michaelmas. Those who had followed the remarks he had made, and the figures he had quoted, would recognize that in making this reduction, in view of the increased payments for rates, the Directors were proposing to run a little risk of a temporary deficiency in the returns; but still they were hopeful that increased business—and it had never yet failed them—would, with the aid of the undivided balance, fully justify the policy. They were sure that in the course they had taken consumers and proprietors alike would see evidence of a desire to promote the best interests of both. He concluded by moving the adoption of the report.

The DEPUTY-CHAIRMAN (Mr. Bertram H. Latter) seconded the resolution, which was carried.

On the motion of the CHAIRMAN, seconded by Mr. HUGH WYATT, dividends were afterwards declared at the rates of 6 per cent. per annum upon the 5 per cent. "A" ordinary stock and 4½ per cent. per annum upon the 3½ per cent. "B" ordinary stock (both less income-tax).

The CHAIRMAN said they now came to the special business of the meeting—namely, the granting of authority to raise further money by means of debenture stock. The remarks which he had already made with reference to the working capital of the Company would have prepared them for this resolution. The outlay which had to be incurred in providing automatic meter supplies was in itself sufficient to require special provision. Such special provision had not yet been made; and therefore the Directors now asked for it. He moved—"That instead of borrowing on mortgage the sum of £3500, the remainder of the moneys which the Company under their Acts of 1865 and 1879 are authorized so to borrow, and instead of borrowing on mortgage the sum of £4166 13s. 4d., the remainder of the moneys which the Company under section 18 of the Act of 1902 are authorized so to borrow, such moneys be raised by means of debenture stock; that a further sum of £7666 13s. 4d. of debenture stock be hereby created accordingly; that such stock bear a perpetual preferential rate of interest of £3 10s. per cent. per annum, payable half yearly on June 30 and Dec. 31 in each year, and be transferable in multiples of £10; and that the Directors be authorized to issue the same, in such amounts and manner, at such times, to such persons, and upon such conditions as they may think fit, subject always to the statutory conditions of issue relating to such stock."

The DEPUTY CHAIRMAN seconded the resolution.

The CHAIRMAN, in answer to questions by Mr. SUTTON, explained that the money would not be raised all at once, but from time to time as was found necessary.

The proceedings terminated with a vote of thanks to the Chairman and Directors and the staff.

WEST HAM GAS COMPANY.

Carburetted Water Gas and Reduced Illuminating Power.

The Half-Yearly Meeting of this Company was held at the Liverpool Street Hotel, on Tuesday last, under the presidency of Mr. J. LISTER GODLEE.

The SECRETARY (Mr. A. G. Snelgrove) read the notice of meeting; and the report and accounts (some particulars from which appeared in last week's "JOURNAL," p. 418) were taken as read.

The CHAIRMAN, on rising, referred to the fact that this was the first time the meeting had been held in London, and said he thought the very gratifying attendance of shareholders showed that the step taken was a right one. There was not a great deal for him to say on the present occasion, as there was only a half-year's work before them. At

the winter meeting, of course, there were the accounts for twelve months to review, and so there was more to refer to. There were, however, some points deserving of their attention. In the first place, it was a great pleasure to the Board to be able to present a report which they could not but feel must be satisfactory to the shareholders generally. It would be seen that, after consulting those who knew best about such matters, the Board had decided that it would be better to raise the whole of the preference and debenture stock authorized at the last meeting as one transaction, rather than issue part in the spring and leave the rest until the autumn; and he thought the result proved they did right. This left them at the present time with a large balance at the bank, most of which was on deposit, though much of it would be required before the end of the year. Turning to the accounts, he might call their attention to the fact that the capital employed—which was one of the most important items in gas company matters—had been reduced to 12s. 4d. per 1000 cubic feet sold, or 4d. less than it was a year ago. They had used 6410 tons less coal than in the corresponding half of 1903, and 398,000 gallons more oil and carburine; or, treating the oil as equivalent to the amount of coal that was usually considered to correspond with it, the consumption of coal and oil equivalent worked out at an increase of 1546 tons. And with this addition, they had made 70 million cubic feet more gas—namely, 655 millions against 585 millions—and sold 68 million feet more. This pointed to most efficient and satisfactory management at the works. He might put it another way. They had this year made 12,257 cubic feet of gas per ton of coal and oil, and sold 11,535 feet per ton—or nearly 1000 cubic feet more per ton than in the corresponding half of 1903. He thought they would all agree that this was a very great increase, and one on which the Engineer (Mr. John Clark) was much to be congratulated. The receipts from residuals were, of course, somewhat lower; the smaller consumption of coal reducing the quantity of residuals produced, while the water-gas plant (which was largely responsible for the results he had mentioned) produced little, if any, residuals. In the present position of the Company, it was difficult to exaggerate the assistance which the introduction of this water-gas plant had been to them. The number of ordinary consumers had increased by 755 during the half year, and that of automatic consumers by 2336. There were now nearly 9000 slot consumers, as against 19,651 ordinary consumers; and they had something like 4000 applications for slot meters awaiting attention. Up to the present time, they had not found it practicable to do much more than keep this number from increasing. They had from 120 to 150 applications a week; and they practically had to tell people that they must wait a considerable time for an installation—in fact, they must take their turn. All gas shareholders appreciated what the use of incandescent burners was capable of doing for them. The system enabled everybody to obtain a better light; and it was making their product more useful, and making it do better work, than before. It was for a time diminishing the actual demand for gas; and this sounded like bad business. It was, however, the best they could do. So long as they could provide a better illumination at a cheaper price, it was impossible to do better business. The effects on the sales of gas of the growth in the number of consumers to which he had referred—in spite of the substitution of incandescent burners for flat flames—was that there was an increased sale of 12 4 per cent. It might be mentioned that the cost of collection in respect of automatic meters (which was a point that was always greatly talked about) worked out in practice at rather less than 1½d. per 1000 cubic feet; while that for ordinary consumers was just about ½d. So that there was 1d. extra cost in getting in the money from the prepayment meters. On the expenditure side, there was a very slight apparent reduction in rates and taxes, which did not represent any important diminution in these charges, but arose from an altered method of presenting the figures. There was actually a small reduction; but he was afraid from the evidence before them—the large loss on the electric lighting undertaking, and items of that sort, which had to come on the rates—that any material relief in this respect could not be looked forward to very hopefully. The Board were engaged in another discussion with the local authorities as to the assessment, which they had proposed to put up to an extent which the Directors did not think reasonable. They were therefore appealing against it; and he hoped for a satisfactory result. It would be noticed that there was a total increased expenditure of £7476; but there was included in this a charge of £12,108 for wear and tear of mains, meters, and stoves, as against £8204 last year, and £7568 was written off capital, as compared with £2548 in the corresponding period. Considering the large amount of wear and tear, and the heavy depreciation of ordinary and prepayment meters, stoves, and fittings which had been written off, it was very satisfactory to find the general result to be an increase in gross profit of £3295—namely, from £23,408 to £26,703. The Directors felt convinced that the safe way was to write off capital as fast as they reasonably could. These were the principal matters which called for attention at the present time. There was an available balance, as stated in the report, of £26,289; and after payment of the full dividends, there would be £5517 to be carried over to the next six months, or considerably more than at this time last year. He ought perhaps to mention that the new gasholder that was being erected on the Company's land at East Ham—at the far end of their district—was rapidly approaching completion; and he hoped when next they met it would be at work, and would be giving valuable help in storing gas and distributing it over their large area. Anyone who saw the extent to which houses were growing round this land would realize that the Company were to be congratulated on having secured the 40 acres when they did and at the price they did. When granting powers for the erection of new works, Parliament, of course, stipulated that they should not be put up within 300 yards of existing houses; but the moment they started building, the houses came up to the works—right up against the fences and the walls. Houses were cropping up all over the place; and they would in due time furnish consumers. He concluded by moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. Thomas S. Geere), in seconding the motion, said that, considering the bad state of trade throughout the country, the Company had done well; and for this he thought great credit was due to their able Engineer.

Mr. CLEVERLEY asked what the expense of the automatic installations was. The last time he put the question, the Chairman told him the cost was from £8 to £9 for each installation; and he wished to know whether any reduction had since been made. He also suggested that something might be done to improve the Company's show-room.

Mr. J. H. BROWN remarked that no one could have followed the history of the West Ham Gas Company during the last few years, and the way in which their recent Bill was carried through Parliament (the raising of preference and debenture stock so satisfactorily), without at once realizing that the shareholders had a Board of Directors and officials of no ordinary ability at the head of affairs. Having been Engineer and Manager to a neighbouring Company for several years, and thus having had opportunities of seeing the Board's policy carried into effect by their very able Engineer, he had always taken considerable interest in the concern; and though considered to a certain extent conservative in some respects, the West Ham Company, among the gas profession, was always held to be one of the best managed of the Suburban Companies. With the new Act of Parliament giving a reduction of candle power and other advantages, on the very progressive lines of the South Metropolitan Gas Company, the Company could be said to have entered upon a fresh existence. The introduction of slot meters had already begun to be felt on the balance-sheet and distribution expenses; meters and stoves showing practically a 25 per cent. increase. There was no doubt that this slot meter business would grow enormously, and tend to establish the position of the Company. The West Ham Company were practically the last Suburban Company to adopt the prepayment system; and their district was such that the business would grow to an almost alarming extent. In face of the statutory reduction of the illuminating power, the adoption of carburetted water gas appeared to many to a certain extent inexplicable. Its effect on the balance-sheet was also very marked. It had reduced carbonizing wages from 4·14d. per 1000 cubic feet in 1903, to 3·63d. for the past half year. It no doubt accounted to a large extent for the reduction in the cost of purification by practically 30 per cent., from 1·28d. to 0·8d. On the other hand, sulphate of ammonia was reduced by practically 30 per cent., from 1 52d. to 1·17d. Tar and coke had also suffered. But perhaps the bulk of this reduction was due to the effect of the markets; and taking the cost of oil into account, he personally doubted whether carburetted water gas could be said to have really effected any direct saving in manufacturing costs, and it would be that its adoption and extended use was due principally to its so-called collateral advantages. He had no doubt the Board considered they had amply sufficient reason for the adoption of this plant. There was one feature of the balance-sheet and of the works also which had always been a specially noticeable figure—namely, carbonizing. On the works, it had been brought to a fine art, and most excellent results were obtained; and when they heard the Chairman state that they were making 12,257 cubic feet per ton, they would all agree that this was a most remarkable figure. He doubted whether among the Metropolitan and Suburban Companies there was another Company that could show such an enormous make and sale of gas per ton. The figures of the balance-sheet, however, put a different aspect on the concern. When he first took up the balance-sheet, he thought that an enormous waste was going on; for on referring to "Field's Analysis," the West Ham Company showed a higher cost of carbonizing and greater charges for repairs and maintenance than any of the other Metropolitan or Suburban Companies, with the exception of Mitcham. He suggested, therefore, that, in the interests of the concern, it would be advisable for the make and sale per ton to be shown on the balance-sheet, so that people could see how these high figures were to a certain extent accounted for. Turning to "Field's Analysis" again, they would see that the average capital employed per 1000 cubic feet sold by the Suburban Companies was 11s.; while that of the three Metropolitan Companies was 11s. 7d. The West Ham Company's was 12s. 4d.; and it should be borne in mind that a new works was in course of construction, and the adoption of automatic installations had only recently been commenced. These two items would therefore largely increase the capital of the undertaking, and every possible item of needless expenditure would have to be guarded against if the position of the Company was to be maintained. Taking the balance-sheet as a whole, the shareholders were to be congratulated; and there was no doubt that when the new works were erected even better results would be obtained.

The CHAIRMAN said he had been very interested in Mr. Brown's speech. With regard to the adoption of water gas, he was practically right in his surmise that the Board had been influenced more by the collateral advantages than by any actual money saving. The question of show-room accommodation was under consideration; and they hoped to make some improvement in this respect. He could not say that up to the present time there had been any material reduction in the cost of automatic installations, though the Engineer was always on the look out in this direction.

The resolution was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. H. C. PELLY, dividends for the half year were declared at the rate of 5 per cent. per annum upon the preference and consolidated ordinary stocks of the Company.

The CHAIRMAN said he had another resolution to move, dealing with the sums in which the debenture stock could be transferred. Hitherto they had stipulated that this should only be done in amounts of £100; but they were now advised that this was an inconvenient arrangement, and he therefore proposed that in future sums of £1 and multiples thereof be transferable.

Mr. J. J. GRIFFITHS seconded this, and it was agreed to.

A vote of thanks to the Chairman and Directors, proposed by Mr. T H. GEERE and seconded by Mr. H. TANNER, ended the proceedings.

The Dunfermline District Committee last week let two other contracts for work in connection with the supply of water to the new Naval works at Queensferry. These are for the construction of conduits. For the section from Glendevon to Dunfermline a tender for £22,092 has been accepted; and for the section to the south of Dunfermline a tender for £23,050 has been accepted.

PROVINCIAL GAS COMPANIES.

Encouraging Day Consumption at Cardiff.

At the ordinary half-yearly meeting of the Cardiff Gas Company on the 4th inst., the Chairman (Mr. C. H. Williams), in moving the adoption of the report and accounts, said he had the satisfaction of announcing good progress in all directions. Not only was there a large general increase in the sale of gas, but the slot-meter installations, which had augmented in number very rapidly, had caused a great demand for gas for cooking purposes, and thus the day load was now specially provided for. The Board had taken a new departure in fixing a special low rate for gas used by engines for motive power; and they were sanguine that, in an important commercial town like Cardiff, a wide field for day consumption was open to them. When large manufacturers became aware that they could obtain gas for their power at something over 2s. 4d. per 1000 cubic feet, a large demand would result. The reduction to all private consumers of another 1d. per 1000 cubic feet, to take effect from the 24th of June last, brought down the price lower than it had been for some years. The Directors were encouraged to take this step because of the largely increased sale that had followed the reduction made in September last. A further concession in price, which he was certain would give satisfaction to the consumers in the suburban districts, was a voluntary reduction of 3d. per 1000 cubic feet, in addition to the 1d. already taken off. The Chairman also explained several other matters of interest, including the new system whereby the gas-cookers rented to ordinary consumers may be bought outright on easy terms, on the three-years instalment system.

Making and Sharing Profits at Chester.

At the 72nd ordinary general meeting of the Chester United Gas Company, the report presented showed a balance of £4053 standing to the credit of the profit and loss account; and the Directors recommended the declaration of an interim dividend on the ordinary stock at the rate of 2½ per cent. In moving the adoption of the report, the Chairman (Mr. John Gamon) said the first point in the accounts that offered scope for comment appeared to be what might be termed the benighted policy of the Corporation in withdrawing gas-lamps from the streets. These withdrawals had been continned during the past half year. He ventured to think that in doing this the Corporation were behind the age. If they had given the Company liberty to improve the public lighting of the city, as they had offered to do, they would have saved the ratepayers' pockets, and acted more in accordance with the accepted policy of all large towns. The accounts showed that the Company had paid off £1750 of the debt upon the retort-house, which was satisfactory; and it was confidently hoped that the whole of the debt would be wiped off by the end of the year, and that the Directors would then be in a position to consider the advisability of lowering the price of gas. The profit-sharing scheme was working very much to the advantage of the Company. The tone of the workmen, and the energy and economy they displayed in making their work as efficient as possible, were telling very much in the Company's favour. The total distribution of profits during last year had amounted to £508 14s. 2d., of which £374 6s. 1d. remained to the credit of the employees as their savings, besides £110 of ordinary gas stock which had been purchased by them. The fact that as much as £80 of the stock belonged to five of the men showed their appreciation of the profit-sharing scheme. After payment of the dividends, there would remain £125 to be carried to the credit of the Company, which was £72 in excess of what they carried forward last half year. The report was adopted. As mentioned last week, an interesting feature of the meeting was the recognition of the services of the Secretary (Mr. James Pye), by granting him a pension of £300 a year on his retirement after having been 50 years with the Company.

Combating Electricity at Malton.

At the half-yearly meeting of the Malton Gas Company last Wednesday, the report presented showed that the sale of gas is increasing, notwithstanding that the position of the undertaking has been challenged by the establishment of the Northern Counties Electricity Supply Company for the public and general lighting of the town. However, the Company have always adopted a liberal policy, and they are continuing to conduct their business on these lines. The Chairman (Mr. H. W. Pearson) explained that when their Act was obtained in 1880, they were given an initial price of 4s. per 1000 cubic feet with the sliding-scale. They had never raised the price above 4s.; on the contrary, they had steadily reduced it until now it was proposed to bring it down to 2s. 6d.—a reduction since the Act was obtained of 1s. 6d., or 37½ per cent., while in the same period the average dividend to the shareholders had only been about 1 or 1½ per cent. more than it was prior to 1880. That the Company could and would, with incandescent gas, supply a better light than the Electricity Company, and at from one-third to one-half the cost, was certain. The electric light no doubt had certain advantages for particular purposes; but they had to be paid for at a price from two to three times that which was paid in Malton for an equivalent illuminating power in gas. A dividend of 6¾ per cent. was declared.

Increasing Prosperity at Tunbridge Wells.

The Chairman of the Tunbridge Wells Gas Company (Alderman W. H. Delves) had the gratification of reporting to the shareholders last Wednesday a considerable increase of 7¾ million cubic feet, or 6½ per cent., in the quantity of gas sold in the past six months; the principal portion being in the first quarter of the year. The effect of this was to raise the gas-rental by something like £1060. The prepayment meters also increased satisfactorily; and 103 were fixed during the half year. Alderman Delves remarked that, considering they had been actively employed for several years in the promotion of this particular branch of their business, he thought they might congratulate themselves that it still showed a growing tendency. Some two or three years ago they adopted the system of maintenance; and it had given great satisfaction to the consumers who used incandescent burners. Over 500 had availed themselves of it up to the end of the half year just closed. They were now putting in new sulphate of ammonia plant, of an improved type and of greater capacity than the old; and they hoped it would be more economical in working. They had made a contract for their coal this year at 6d. per ton less than last year; and this on 20,000 tons came to a large sum. The price of oil, however, had gone up very considerably; and they would have to pay ¾d. a gallon more during the current half year. The Company had made steady progress; and they entered upon the second half of the year with good prospects. Dividends at the rates of 11½, 9, and 8½ per cent. were declared out of the £5253 available for distribution.

A Good Record at York.

In the six months ending the 30th of June, the consumption of gas in York was 4·82 per cent. more than in the corresponding period of 1903, and was the largest the Company have had to record in any half year of their existence. There were 1470 yards of additional mains laid, 468 meters were put in for new consumers, 692 additional cookers, 142 gas fires and boilers, and 1172 additional lights fixed by the Company's own workmen, beyond those which had been supplied by other gas-fitters. The revenue was £42,379, and the expenditure £33,322; leaving a balance of £9057. The amount available for distribution at the recent half-yearly meeting was £9275; and the Directors recommended its appropriation as follows: Payment of interest at the rate of 3½ per cent. per annum (less income-tax) on £25,000 borrowed money, £416; payment of dividends at the rate of 4 per cent. per annum on £40,000 of preference stock, £762; and on £370,000 of consolidated ordinary stock, £7045—leaving a surplus to be carried forward of £1052. In moving the adoption of the report, the Chairman (Mr. J. R. Hill) referred to the increase of 4·82 per cent. in the consumption of gas as all the more satisfactory in view of the loss the Company had had to bear by the North-Eastern Railway Company having extended their own gas-works, and so decreased by a considerable quantity their consumption of the York Company's gas. While the Directors would have been glad to retain the custom of the Railway Company, they could not but feel some satisfaction that the loss was not due to the substitution of a rival illuminant, and was, in fact, another testimony to the value of gas as a commodity. The extension of incandescent lighting also diminished the quantity of gas used, and so contributed to make the increase the more significant. The report was adopted.

GAS CO-PARTNERS AT THE CRYSTAL PALACE.

"If this admirable example is at all widely followed—and in course of time it is bound to be the almost universal practice—you will have done more for the efficiency of British industry, and the happiness and unity of England, than all the politicians put together." These are the words of Earl Grey in a letter to Sir George Livesey, in which he regretted his inability to be present at the celebration last Thursday, of "the most important step" taken in applying the co-partnership principle to gas companies, and expressed very earnestly his good wishes to the co-partners. The "celebration" was the annual dinner at the Crystal Palace given jointly by the Directors of the South Metropolitan and South Suburban Gas Companies to the employees of the two concerns—not to all, but each year to different representative co-partners. They have to "take turns," as it were, at being present. On this occasion the number who sat down to dinner—Directors, officers, men and wives—was, to be exact, 402; and if Earl Grey could have been present, and seen and heard, he would have been fortified in the convictions so well stated in the quotation, and would have emphasized them at greater length than he was able to do in his letter.

Of course, Sir George Livesey was in the chair; and at the ends of the long rows of tables, lined on either side by the happy faces of the men and their wives, were noticed from the South Metropolitan Company: Mr. J. Ewart, Mr. J. Mews, Mr. H. Austin, Mr. J. Butcher, Mr. C. T. Drumgold (Directors, the three latter being the employee representatives on the Board), Mr. Charles Carpenter (Chief Engineer), Mr. Frank Bush (Secretary), Mr. J. Tysoe, Mr. A. F. Browne, and Mr. W. D. Hunter (Engineers), and Mr. H. C. Sims (the Secretary of the Co-Partnership Committee); from the South Suburban Gas Company: Sir Fortescue Flannery, M.P., Mr. Charles Hunt (Directors), Mr. S. Y. Shoubridge (Engineer), Mr. Charles M. Ohren (Secretary), and Mr. Jones, the Secretary of the Co-Partnership Committee. Next to Mr. Ohren sat his father and predecessor in office (Mr. Magnus Ohren), looking stronger than a year since, and happy in being in the midst of old fellow-workers and such joyous surroundings. Mr. Charles Tanner, of yore Chief Foreman at the Old Kent Road Works of the South Metropolitan Company, and now on the "retired list," was also present. This is sufficient to show that the past and present were well represented; and that it was altogether quite a united family party. The dinner was well served by Messrs. J. Lyons and Co., Limited.

After the repast, there were two toasts, and several votes of thanks, all being accompanied by some good speeches. The first toast was "The King," whom the Chairman appropriately described as "the Peacemaker." The second toast was "Prosperity to the South Metropolitan and South Suburban Gas Companies." Remarking upon the alteration of the name of the latter, Sir George stated that the change in title was not made because they disliked the name of "Crystal Palace." The Company, as a matter of fact, owed a great deal to the Crystal Palace; but people would not give the Company their proper name. They had three words in their title—"Crystal Palace District" Gas Company; but people always dropped the "District." They had therefore now got a name with only two distinguishing words in it, "South Suburban," as in the case of the "South Metropolitan." He asked those present to join him in wishing prosperity to both Companies; and he did so for this reason, because they were both engaged in a useful work—a work that was necessary for the welfare and comfort of the public. Therefore they might consider themselves engaged in a work that was both necessary and useful; and they might be proud of it. Artificial light was a necessity of the present day, and they were

providing an artificial light that the public wanted, and which they showed they wanted by the way they used it. Sir George illustrated this by referring to what had been done in the slot-meter business. It was, he said, only about twelve years since that they began this system; and now the two Companies had fitted up 180,000 working-class dwellings with slot meters, fittings, and cooking-stoves. This was a great benefit and boon to these consumers. He did not want his people to get too exalted an opinion of the importance of their work; but there was another thing that they might claim—that it was a work that was carried on fairly for the benefit of all parties interested. The consumers were treated fairly by the system under which both Companies worked. If they could reduce the price of gas, they were allowed to increase their dividend. The consumers, however, got about six times as much as the shareholders. This was perfectly fair. If they could reduce the price by 1d. per 1000 cubic feet, the Companies could increase their dividend by about 2s. or 2s. 6d. per cent. This identified the interests of two of the parties. The sliding-scale came into operation, so far as the consumers and shareholders were concerned, nearly thirty years ago; but it was not extended to the employees until, in the case of the South Metropolitan Gas Company, 1889, and, in that of the South Suburban Gas Company, in 1893. The first bonus that was distributed by the former was in 1890, and by the latter in 1894. This, it was considered, completed the matter. It made all three interests identical; and this was the ideal of good trading. Good trading was not a system which "beggars my neighbour," but a system which "benefits my neighbour;" and the Companies were now conferring a benefit all round. If the employees were simply paid a wage, the system would not be complete, because the simple wages system was not sufficient to make the identity of interest to obtain the greatest prosperity. Having said this much, it would convince those present that in asking them to wish prosperity to the two Companies, he was not asking them to do what was unreasonable. He had hoped to have had a nobleman with them on this occasion. He referred to Earl Grey; and it was something to have a nobleman in his position taking a real interest in the co-partnership system. (Sir George read the letter from Earl Grey from which the extracts are taken with which this review of Thursday's proceedings opens.) His Lordship recognized that they were doing something important. By "they" he (Sir George) meant the Directors, the officers, the men, and their wives; and he went on to show how the wives could help their husbands to improve their position by encouraging them to save their bonuses. At the meeting of the South Metropolitan Company the previous day, a shareholder had said that the country might be divided into two classes—employers and employed; and he added that the two had in the past been kept at arm's length. Now what had their co-partnership system done? It had brought employers and employed together. They were now all employers and employed. "You," said the Chairman, "are all shareholders, as shareholders you are employers, and yet you are all employed. You cannot have much better unity than this." The result had been one of which he had never dreamed. The employees of the South Metropolitan Company had over £225,000 in the Company—nearly a quarter of a million of money; while the employees of the South Suburban Company, which was only one-tenth the size of the South Metropolitan Company (that was to say, doing only one-tenth of the business), had done as well, perhaps a little better, in proportion, for in eleven years they had got £20,500 in the Company. Therefore the employees of the two Companies had invested and on deposit in the two concerns close upon a quarter of a million of money. This was an enormous sum; and it was due entirely to this co-partnership principle. If they had not started it, this money would not now have been in existence. It had not come out of the pockets of the shareholders or the consumers, because, he was happy to say, that the greater part of the Companies' people put their hearts into their work, feeling an interest in their respective Companies, and were doing their duty, and in this way they had created what they possessed. All they asked and expected was that the men should do their duty. Nelson's great signal was: "England expects that every man will this day do his duty." But a greater than Nelson had said: "Whatsoever ye would that men should do to you, do ye even so to them." It was the duty of employers and employees to do the one to the other exactly the same as they would wish to be done by if their positions were reversed. This had been done to a great extent in these two Companies; and the result was this large amount of money which had been produced by the better work, by the carefulness, by the desire to save time and money, and by the interest taken in the concerns by the employees. The disappointing thing was that so few followed them. The Commercial Gas Company had adopted the principle, and so had the Chester and Newport (Mon.) Gas Companies. He (Sir George) was often told that the principle was not applicable to ordinary business; but it is easily applicable (they had proved) to the gas business. But the gas companies would not apply it. He did not know why. If they were wise, they would, because he could say this, that now difficulties about labour never entered into the heads of the Directors or officers of their own Companies, and, far from wishing to displace labour, they were only too glad to be able to employ as much as possible.

Reply was made to the toast on behalf of the South Metropolitan Company by Mr. Mews, and on behalf of the South Suburban Company by Mr. Charles Hunt. The former gentleman stated that the co-partnership system seemed to have got rid of all difficulty that was formerly opposed to working people saving money; and Mr. Hunt could find no reason to doubt that the co-partnership system had greatly contributed to the success of the South Suburban Company. They looked forward to the approval of the shareholders next day to the completion of the scheme by the proposed admission to the directorship of nominees of the employees. They had every reason to believe that, whoever might be nominated would—having regard to the experience of the South Metropolitan Company in this respect—not consider themselves simply as delegates of their class, but that they would take a broad interest in the Company's affairs; and he could say, on behalf of the present Directors, that they would greatly welcome their co-operation. He also expressed the hope that Sir George would be spared to preside over many gatherings similar to the one in which they were taking part that day. It was here mentioned by the Chairman that the amount of money distributed by the two Companies under the co-partnership system this last July was: By the South Metropolitan Company £34,400 (next year it would be quite £40,000); and by the South Suburban Company, it was £2500.

Then came the turn of the men. It fell to Mr. Whitehead to propose a vote of thanks to the Chairman and Directors, on the part of the South Metropolitan employees, for the invitation to the festival, and for allowing them to continue to participate in the co-partnership system. He expressed, as a working man, some surprise that more companies had not taken up this system. The motion was seconded by Mr. Beard. Then came another resolution, proposed by Mr. Seage, in which the men heartily tendered their thanks to Mr. Carpenter, Mr. Bush, and the clerical staff. Mr. Carpenter, the proposer said, was a man whom any body of workmen would be proud to follow; and Mr. Bush they all regarded as an old friend. This proposition was seconded by Mr. Earp. For the South Suburban Gas Company, Mr. H. Glass moved a vote of thanks to the Chairman and Directors. He remarked that, before the profit-sharing system was started at their works, it had never once struck him that he would be the proud possessor of stock in the Company. He also stated that his stock stood in the joint names of his wife and himself; and this was a great safeguard against the temptation to sell. This brought from the Chairman the observation that he was happy to hear this reference to the wife being a co-partner. He was pleased to say that a large proportion of the men in the South Metropolitan Company, as well as of the South Suburban, had their wives' names also on their stock certificates. The motion was seconded by Mr. W. Pilcher. Then Mr. J. Hirst imparted information as to the working of the benevolent and widows' and orphans' funds at the Vauxhall works; and he urged their adoption at the stations where they were not in existence. Mr. Charles Tanner made an animated speech; and then Mr. Austin (one of the Employee Directors) had a shot at the "so-called" socialists, who had been throwing dirty water on their co-partnership system. What it had done had eclipsed anything that the Socialists had ever accomplished, or would ever accomplish. He also mentioned that the dividend on the stock of the South Metropolitan men for last half year amounted to £3020.

Then succeeded the acknowledgment of the votes by the chief officials of the two Companies. From Mr. Carpenter fell the view that co-partnership was the beginning of a new era for what was called (for want of a better name) the working class. Co-partnership, too—he was going to say had made men of them; but this was not true. What was true was that co-partnership had enabled them to develop as men. This time last year, subsequently remarked Mr. Bush, they were congratulating themselves on being possessed of £190,000 in the South Metropolitan Company; to-day, their stock exceeded £225,000. It had been said by some who were hostile to this system that the bulk of this stock belonged to the officers. He (Mr. Bush) knew this to be fallacious. But he had taken the trouble to get out the figures, and to divide that which belonged to the officers from that which belonged to the wage earners; and he thought they would be surprised to know that the latter in the aggregate held three-and-a-half times as much as the officers. These were the exact figures: There were about 4500 co-partners. It might be taken that there were about 250 officers; and this left 4250 workmen, who held, out of the £225,000, about £175,000—leaving £50,000 to the officers. The average holding of the officers was £200; and that of the workmen rather over £40.

A few remarks were introduced here by Sir Fortescue Flannery, M.P., one of the Directors of the South Suburban Company. He saw in the example of co-partnership which the two Companies had set up the germs of the social salvation of the workers of the country; and he believed that the beginning that had been made, under the auspices of Sir George Livesey would go forward, and would be the means of entirely destroying the great evil that had for so many years attacked the prosperity of British industry, and that was the unrest and want of peace between employers and employed. Later in his speech, he stated that, in checking over the register of proprietors of the South Suburban Company the previous day, he was delighted to find what a large number of the men had associated their wives' names with their own as joint holders of stock. Another remark that met with great approbation was to the effect that the Chairman had spoken of being disappointed because there was not a nobleman present; but "we have," said Sir Fortescue, "as good a nobleman in our Chairman as we want." Concluding his remarks, he sincerely hoped the two Companies would go on setting an example to the whole industrial world.

A few observations were made by Mr. S. Y. Shoubridge, and then the Chairman replied for himself and his fellow-Directors—concluding his remarks with the words: "You are doing a great work for England. Go on, and prosper."

The rest of the day was spent in the pleasures provided by the Palace, together with one short re-union in the same dining-room for tea. The weather was not so brilliant as would have been preferred; but the happiness of the "co-partners" was as adamant against weather influences.

Gas-Pipes and Water-Works Extensions in Dublin.—At the last monthly meeting of the Dublin Corporation, a serious complaint was brought forward by one of the Labour members regarding the unnecessary opening of streets in the carrying out of the North City water-works extension scheme. It was pointed out that the surface of some four or five streets had been unnecessarily broken up. Another member said it was because the workmen were misled by the maps showing where the gas-pipes were. Alderman Cotton (the Managing-Director of the Alliance and Dublin Consumers' Gas Company) said these were not the maps of the Gas Company. With regard to some of the streets, it was actually pointed out to the Corporation officers where the gas-mains were; but, in spite of this, the men persistently went on with the work. He blamed the supervisors and not the men for what was done. Even supposing the Corporation had no maps, all that had to be done was to go to the Gas Company's offices, where full information was available. The Council decided to call for a further report.

BISHOP'S STORTFORD COUNCIL AND THE GAS-WORKS.

Report by Sir George Livesey.

The Bishop's Stortford Urban District Council having manifested a desire to acquire the undertaking of the Bishop's Stortford Gas Company, the Clerk (Mr. T. Swatheridge) was instructed to submit the following points to Sir George Livesey, and request his opinion thereon: (1) The condition of the Company's works; (2) the probable maintainable profits; (3) the capability of the works to maintain profits; (4) the advisability of acquiring the undertaking; and (5) generally on the terms of purchase. His report was duly sent in, as follows.

From such information as I have been able to obtain, and from an examination of the accounts, I think it may fairly be assumed that the works are in good order, and fully up to their work. My opinion in this report is based on that assumption.

I see no reason to doubt that the profits earned in the three years to June 30, 1903, can be maintained. The gross profit of the revenue account was: To June 30, 1901, £1646 14s. 6d.; to June 30, 1902, £1596 12s. 5d.; to June 30, 1903, £1716 18s. 1d.—notwithstanding the drop of 4d. per 1000 feet, from 4s. 2d. to 3s. 10d. from July 1, 1901, amounting to about £480 on the gas sold. The profit only fell £50 in the next year; while in the following year it rose £120. I should much like to know the figures for the year just ended; but they are not yet obtainable, though they will very soon be forthcoming. In addition to the dividends of 5 and 5½ per cent., and payment of interest on debentures, the Company added £400 each year to the reserve fund. This they can do no longer under their new Act, except by foregoing dividend. They will therefore be entitled to divide this £400, supposing it to be earned, which would bring up the dividend to nearly 7½ per cent.—the figure to which they are entitled under the sliding-scale of their Act. Whether they do so or not, it is certain that in the event of going to arbitration they will produce evidence to prove that they can make and maintain sufficient profit to pay their full dividend of 7½ per cent. under the sliding-scale; and they will probably be able to prove it to the satisfaction of the Umpire. If so, the figures will stand thus: The ordinary capital is £22,000, on which a dividend of 7½ per cent. amounts to £1650; 4 per cent. on the £1000 preference capital amounts to £40, making £1690. I think it very probable that the Company will make this amount of profit *plus* the interest on the debenture stock and on temporary loans; but not having seen the last year's accounts, which are not yet made public, and probably are not made up, I can only form the opinion from a review of their past working. I feel, however, justified in advising you that, in all probability, the Company will be able to show that they can maintain a profit after paying interest of £1690.

The question of the advisability of purchase involves two important considerations: (*a*) Whether it will be to the advantage of the ratepayers, and (*b*) whether it will be to the advantage of the consumers of gas. As to the ratepayers, it is possible the price to be paid may be such that it will be impossible to make both ends meet without raising the price of gas or keeping it up at a higher figure than the Company would have done. But the only object of purchase that occurs to me is that, after paying all charges incident to the manufacture of gas, with interest, sinking fund, &c., there may be a good surplus to be used in aid of the rates. That is, the consumers of gas are to be charged such a price as will provide this surplus profit. On this point two questions arise: Are such surplus profits like'y; and, if so, would it be just to the consumers of gas to make these surplus profits? In short, would it be just to make the consumers of gas not only pay their own ordinary rates, but also contribute towards the rates of others? The interests of the ratepayers and of the consumers of gas are antagonistic, and the latter usually go to the wall; whereas with a gas company under the sliding-scale, as is the case at Bishop's Stortford, the interests of the Company and of the consumers are identical, for every reduction in the price of gas entitles the shareholder to an increase of dividend. If, as is very likely, the Company should soon be in a position to reduce the price to 3s. 8d., the shareholders would be entitled to a dividend of 8 per cent. Sliding-scale company management tends to reductions of price of gas, whereas municipal management tends to keep up the price in order to obtain surplus profits in aid of rates. Considering the price the Council would probably have to pay, I do not think any surplus profits are likely, except by increasing the price of gas. This answers both questions marked (a) and (b). The purchase would be to the advantage of neither ratepayers nor consumers. Unless the accounts for the year to June 30 last show that the profits I have assumed as likely cannot be maintained, and until that is shown, I must stand by the figures given under question No. 2. I take £1690 as the figure, and, have now to deal with the number of years' purchase an umpire would give. It would not be so low as 25 years, considering the strong position of the Company and recent precedents; for I am not aware that anything so low has been awarded. On the other hand, I do not think it would be higher than, if so high as, 28½ years' purchase. A very moderate figure would be 27 years, or (say) including the 2½ per cent. for compulsory purchase, 27½ years. Then—

£1690 by 27½	£46,475
Add debenture debt	7,208
,, Sundry expenses, cost of Act and arbitration, &c.—say, at least	2,000
,, for working capital—say	1,500
Total	£57,183

And there may be a loan from bankers or an issue of preference stock; but on these points I have no information.

At what rate can the District Council raise the money? The last issue of London County 3 per cent. stock was at £90, or at the rate of £3 6s. 8d. per cent. Taking 3½ per cent. as a safe figure for Bishop's Stortford, and adding (say) 1 per cent. for sinking fund, the annual charge on the £57,183 will be £2573. The Company will be able to pay 7½ per cent. interest on its ordinary capital, 4 per cent. on the £1000 of preference capital, 4 per cent. on the £7208 of debenture stock, and (say) £60 as interest on temporary loans at a charge (£1690 interest on capital, £288 on debenture stock, and the £60) of £2028, or £535 less then the charge to the Council. The £535 represents about 4d. per 1000 cubic feet on the price of gas. Therefore, if my estimate is correct, the consumers will have to pay 4d. per 1000 cubic feet more to the Council than to the Company to make both ends meet; and if the Council want surplus profits, the difference will be greater. Even if the purchase price were as low as £50,000, which would, of course, be based on a lower estimate of maintainable profits, still the Council would need some £400 a year more than the Company, or about 3d. more per 1000 cubic feet from the consumers. In all these cases of transfer, I fail to see any consideration for, or allusion to, the interests of the consumers; and as one in whose gas company management during a long life the interest of the consumers has always been an important consideration (I was the author, thirty years ago, of the sliding-scale as applied to gas companies, and I proposed it for the mutual benefit of both parties), I feel it right to put their position before you in your consideration of the question of purchase.

In a subsequent letter, Sir George Livesey allowed for the Directors' fees as a possible saving. On this point he wrote: "£105 is charged in the accounts of the Gas Company which the Council, of course, will not have to pay. But whether they would save the money is another question; for a good Board of Directors would certainly earn their fees, especially with a man among them so well up in gas matters as Mr. Burton. If the Council could find an equally good Committee, they should do equally well; but they would lack the strong motive of self-interest and the stimulus of the shareholders that influence a Board of Directors.

The members of the Council put a number of questions to Sir George Livesey on the subject of his report; and at the close of the interview he promised to send a supplementary report on the works.

INTERFERENCE WITH GAS AND WATER MAINS BY ELECTRIC TRAMWAYS.

(*Concluded from p.* 412.)

We conclude to-day our report of the arbitration between the East London Water-Works Company and West Ham Gas Company and the West Ham Corporation, with reference to a dispute as to the necessity for alteration of the gas and water mains and services in consequence of the laying down of a tramway.

The Case for the Corporation.

Immediately on the conclusion of the evidence for the Gas Company, witnesses were called on behalf of the Corporation; the first being Mr. H. W. Greaves, Chief Assistant to the Town Clerk, who stated that when it was resolved to promote the Bill of 1900 (under which the tramway was to be constructed), the Council decided to pave the whole width of the road at the same time that the tramway was put down. Mr. Moon objected to this evidence; but Mr. Danckwerts said that it was most material. The suggestion was that the mains should be laterally moved outside the tramways; and part of the complaint was of the concrete. He intended to show that the Corporation had long before resolved, under the Public Health Act, to do the concreting outside the tramways over the whole of their roads; and consequently it was of no advantage to shift the main so far as the concreting was concerned. This was his point—to prove that they could not get away from the concrete by a lateral deviation. His whole case depended upon this.

The next witness was Mr. G. F. L. Foulger, the Chief Distributing Engineer of the Gaslight and Coke Company, who stated that he had under his charge a district of some 63 square miles, containing over 2000 miles of cast-iron mains. The Company had mains in West Ham; but they had not taken any proceedings under the Act of 1900, though they were served by the Corporation with a similar notice to that given to the other Companies. Owing to experience of steam-rollers, it had been his practice to shift the service-mains under the foot-ways whenever possible. They had also mains beneath tramways, and a large number of various sizes under concrete. In the Metropolis, they had a great number of obstacles to encounter in laying their mains. First of all, there were the underground railways—not the "tube" railways, which were at a great depth—and then there were the water-mains, fire-hydrants, gullies, house-drains, underground urinals, fire-alarm wires, hydraulic pipes, electric cables, and telephone wires. Much greater obstacles than tram-rails joined together by cross-sections had to be encountered. When tramways first came into use, he feared that they would be a great hindrance to a gas company's business; but in practice this was not borne out. In connection with the Company's mains under tramways, he could not say that he had had any difficulties with regard to repairs. Of course, if he were going to lay a main for the first time, he would not elect to go under a tramway. He thought the question was entirely one of cost. He was bound to say, however, that he was unable to appraise the value of the additional cost of dealing with any cases of an escape from a main, &c., where there was a tramway. As a matter of fact, his Company had never made a claim on a tramway company for any additional cost they were put to, because they had a difficulty in saying there was any extra cost. He did not agree that a pipe running longitudinally and parallel to the rails was a great cause of difficulty.

In cross-examination by Mr. Moon, witness admitted that in his district in London where there were tramways there were duplicate service-mains, one on each side of the street, so that they never required to carry their services across the tramways. There were, however, in the district mains which ran longitudinally under the tramways; and when they had to repair them, they stopped the tramway traffic—or rather, they arranged with the tramway company

to put in a "turnout," so that if there was (say) an escape under one line of rails, both the up and down traffic could be taken over the other. He could not say whether a "turnout" could be put in between two electric lines, as in his Company's district there was not a single electric tramway. He said there was practically no difference in the cost of the repair of trunk mains if they were under a tramway formation. The presence of the rails had not affected him appreciably in any way which would enable him to make a charge, or which had increased the cost of dealing with escapes. They did not take up the rails, as their presence over the hole made in the ground did not interfere with the work. The depth of the mains varied; but the average where repairs had been done under a tramway would be 2 feet. As to service-mains, he strongly objected to these being in the roadway at all; he thought they all ought to be under the footways. But supposing they were in the roadway, he did not think it was more expensive to repair them when there was a tramway. It was more expensive to deal with the service connection, because there might be difficulties as to the drilling apparatus; but with regard to repairs on mains, he did not consider there was any difference in dealing with those under tramways. If the main was right in the centre of the road, it would be altogether clear of the metals. Supposing the men were in the centre of a tramway track, they could work just as well there if the trams were passing, because the trench would be deep enough for the men to stoop down. Some of his Company's pipes were 4 feet in diameter; and very often they had to make a hole 12 feet deep, in order to get down underneath to locate the exact spot.

Mr. James K. Bock, the Borough Electrical Engineer for West Ham, explained what the Corporation intended to do. He said that in the streets where the tramways were to be, they were laying under the footways cables for the supply of current; both the alternating current cables for lighting and the continuous current cables for power being in the same trench. The top of the pipes into which the cables were to be drawn was generally from 12 to 18 inches from the underside of the paving. This was their intention. They were 4 inches outside diameter; and in many cases there were four layers; so that at the outside they occupied 18 inches. He had shown Mr. Clark where he intended to lay the pipes, and the amount of room taken up by them in the footpaths. He also explained that the pipes could be raised or lowered a few inches, if necessary, to meet his requirements.

Mr. J. G. Morley, the Borough Engineer of West Ham, also spoke to the fact that the Corporation all along intended to concrete the whole width of the roads. The requirements of the Companies appeared to him to be quite unnecessary; and as the road would be concreted right across, practically nothing would be gained on the ground of facility of access by moving the pipes from underneath the tramways.

The next witness was Mr. W. M. Murphy, who stated that in his 25 years' experience of the construction and maintenance of tramways, he had never had a claim of this kind made. He had never seen any difficulty whatever in connecting gas or water mains with a house, or taking out gas and water mains and replacing them, or in doing any work which was done before the tramways came there. He had had a case where he had to lower a main, in connection with the London (Southern) Tramways. There they went under a bridge where there was not sufficient headway; and they had to lower the surface of the road and expose and lower the main. Where concrete was put on a road which was previously macadam, there was little extra expense in cutting through 6 inches of concrete, beyond what would be incurred in dealing with a similar depth of macadam; and this was, so far as he could see, the whole additional outlay imposed on the water, gas, or sewer authority. He thought there was no necessity for the lateral diversion of gas or water pipes in order to bring them outside tramway construction.

Cross-examined by Mr. Moon, witness said it appeared to him from reading the Ilford case that the decision was given under a misapprehension of what the construction was.

Mr. Stephen Sellon said that he had laid down many hundreds of miles of tramways; and he had never known such a claim as the present one. No danger arose to gas and water companies through the laying of tramways. The very fact of putting down a large bed of concrete over existing pipes was in itself a great method of protection beyond what previously existed. Taking a street where the traffic was very heavy, undoubtedly the safest position for the pipes was underneath where the tramway was to be laid, in view of the existence of the concrete. A tramway, when constructed first, had its superstructure on concrete; and then it had rails, generally equal to something like 100 lbs. a yard, which distributed the weight of the vehicle over the whole of the area on which the car passed. It would therefore be found that the crushing strain which would be due to ordinary traffic (such as a heavy traction engine, which in some cases weighed quite as much as a tram-car loaded) would be much more likely to damage pipes in the road than would be possible in the case of a tram-car. The distributed weight of a tram-car over the ground occupied by it was many tons over each wheel; and it worked out at something like one-sixth of a ton over each square foot of concrete. The crushing strain on an ordinarily constructed road worked out from 1 to 3 tons per square foot; whereas the crushing strain of a mass of concrete 6 inches thick, over the same area, worked out at from 80 to 100 tons per square foot before it could be damaged. There was therefore a very much larger margin of safety by putting concrete over the pipes than could be had in the ordinary macadamized or manufactured road. Mr. Cripps said that his case was based solely on the question of access to the pipes for the purposes of repair, and so on. He certainly was not going to suggest that underneath a tramway was not a safe place for a pipe, so far as its actual security was concerned. The examination of the witness was thereupon directed to this point, and he said that the difficulty of access was merely cutting through the concrete. In a road concreted all over, this would be just as great on the margin as under the tramway construction. The demand for duplicate mains on either side of the road was most unjustifiable. Such a demand could only be made on a tramway company if it could be shown that the pipes would be in danger; and then the parties might enter into a friendly arrangement to decide what would be the best course to adopt. Obviously, the tramway company, in case of danger, would have to lower the pipes to a position at which danger disappeared, or else they would have to adopt some other method, which was very often a matter of arrangement. There was nothing special in the construction under consideration to impede the supply of water or gas. If a pipe was found to be endangered, they had either to lower it or protect it in some other way; and while doing so, if it necessitated the removal of a pipe, the tramway authority had, under a heavy penalty, to provide some other means of keeping up the flow unimpeded. The difficulty of tracing a leak was no greater if a pipe was under a tramway than in the concreted margin of the road.

In cross-examination, witness was requested to explain himself on a certain point; and he said that, in constructing tramways, they were often asked by gas and water companies to consider the question of their pipes before laying; and assuming that the tramway authority had to move the pipes, and assuming it was agreed that they might be endangered, the point as to whether the pipes should be lowered or deviated was entirely one for arrangement between the parties. There had been many cases in which, when he had come to the conclusion, in a narrow street, that the mains had to be moved in consequence clearly of being too close to the surface, he had thought it advisable to agree with the gas and water companies that he would move them to the sides of the road; but in such instances the companies concerned had always met him, in so far that they had given him their views. He had very often gone to the expense of making the trench for them; but it was obviously a matter of arrangement, and not of demand. Under certain conditions, he was quite ready to admit that it would be better for both parties to have the pipes outside the tramway construction; but in the case of a road that was concreted over, he did not think it would be of much assistance to gas and water companies—he did not see any real advantage. The tramway authority might receive a little benefit, because it would absolutely prevent them from being called upon to stop their traffic.

The Engineer to the tramways, Mr. J. E. Waller, explained the scheme, and detailed the correspondence he had had with Mr. Bryan. He admitted that if a pipe was going to be endangered by the tramways, he was bound to alter it; and he said he was perfectly willing to do so. There was absolutely nothing in the circumstances likely to endanger the gas or water mains; and as regarded the question of access, there was no difference at all, except if the pipe happened to run longitudinally under the rail for a considerable distance. Then there would, when access was wanted, be a little more expense. If he had thought it necessary to alter any pipes in the interests of the Corporation, he was, under the Act, given powers to do it. He thought the setting fire to gas by sparking at the wheels was a purely imaginary danger. With regard to the Companies' requirements, he said that in respect of a tramway $8\frac{1}{8}$ miles long, it was requested that $6\frac{1}{4}$ miles of new mains should be laid and $7\frac{3}{8}$ miles laterally diverted; so that for every mile of tramway laid, the Corporation were called upon to carry out on the average nearly $1\frac{3}{8}$ miles of work in connection with the gas and water mains. Not a single one of the requirements was suggested because of danger; it was all apparently a matter of convenience.

In cross-examination by Mr. Moon, witness said that so long as the actual construction of the tramway did not affect or interfere with any of the pipes, the Companies had no right to claim anything from the Corporation. He had written to Mr. Clark to the effect that where any gas-main would be under the portion of the roads occupied by the tramways, and the depth from the top of such main to the surface of the roadway would be less than 2 feet, he should be prepared to recommend the Corporation to bear the expense of either lowering the main or diverting it laterally, as might be found desirable. This was, however, a concession to avoid legal action; and as he had not succeeded in that, he withdrew his offer to divert any mains. He could not go looking for the pipes; and the Company were unable to tell him where they were. He was perfectly willing to be made responsible for altering pipes that he found within the depth of his tramway work; but he did not think that he ought to have an undefined liability in respect of any pipes that hereafter might be discovered, and which he had never seen to be under his tramways. It therefore came to this, that if the pipes were lower than 1 ft. 1 in. below the surface, he was not to be under any obligation to alter the position of them. He agreed that when a rail was dirty, there might be sparking from the wheel. If the Gas Company were put to any extra cost in making a service connection across a line of tramways, they would get their remedy under the Tramways Act. So far as he was able to construe section 32, this seemed to him to be clearly set forth.

Re-examined by Mr. Danckwerts, witness said that, a month before, he had written informing Mr. Clark that he had come across a branch main the top of which was less than a foot below the surface of the road, and that he was prepared, on behalf of the Corporation, to pay the expense of lowering this pipe so far as it extended under the tramway. He asked whether the Company would be prepared to do, at the expense of the Corporation, the work required in connection with this and similar pipes; and Mr. Clark replied that, as the arbitration was to be heard very shortly, he objected to any interference with the mains in the meantime.

Mr. Alfred Baker, the Tramways Manager to the London County Council, said that, so far as his experience went, he did not think there was any necessity for shifting the gas and water pipes from underneath the tramways, unless they were within a few inches from the surface of the road.

Mr. H. E. Jones said that he had had considerable experience of tramways, and he had never found it necessary, acting for the Commercial Gas Company or other companies, to make any requisitions as to the lateral movement of pipes. They had, however, in certain places been lowered to admit a depth of concrete going over them where they were too near the surface of the road. Where the concrete was carried all over the road, there was, in his opinion, no greater difficulty with regard to access to pipes under a tramway than with those outside. Of course, concreted and paved roads were a formidable trouble always. There was just the extra difficulty of the continuous girder on which the wheels of the tramway ran, to the extent of 7 inches in width. This was a thing which was more or less fixed, and could not be moved without some expense; but it could be taken

out if necessary. Under the ordinary system of laying, there would be several arterial mains near the centre of the road; but they seldom leaked or required alteration or connections, and on the rare occasions when this had happened they had found great difficulty in showing much more expense. He did not think either the Wandsworth or the Commercial Company had ever made a claim for extra cost. He could conceive circumstances in which they would do so, and might do so yet; but hitherto this had not happened in his experience. The pipes for electric lighting (which were close to the houses, and sometimes went very deep) were much more serious obstacles than tramways in the centre of the road, which were only about 2 feet deep at the outside.

In reply to Mr. Cripps, witness said that if he were advising a water company who were going to lay down pipes for the first time in a road where there was already a tramway track, he would recommend them to be put outside the tramway works, unless the road was too narrow. They kept everything in its own road as far as possible.

Questioned by Mr. Moon, witness admitted that in the case of the Commercial Gas Company they almost invariably had duplicate mains, so that they did not have to run the services across the tramway track. Unless the tramway could be stopped, repairs to pipes underneath would take longer. The men would have to come out of the trench when the cars passed; and, if the service was constant, they would always be stopping. He, however, took it that the tramway authority would have to pay for this. They could not ask gas and water companies to do their work in this sort of way without compensating them for the extra cost.

Re-examined by Mr. Danckwerts, witness said this difficulty could be got rid of by working at night, and charging the additional expense to the tramway authority. When laying a pipe for the first time, the tramway being already in position, he would not put it down longitudinally under the tramway if there was room elsewhere; but in a narrow road he might be driven to it.

At the commencement of the next sitting, the Arbitrator intimated that he was satisfied the putting down of the tramway did cause some injurious affection to the pipes of the Gas and Water Companies in regard to access. The question he was not satisfied about, either one way or the other, was whether the application now made was the appropriate remedy for the state of things the Companies had proved. By "injurious affection," he meant extra cost. Upon the point that appreciable extra cost in the future would be caused by the interposition of the tramway, he had quite made up his mind. Mr. Danckwerts said it might be assumed that there would be some extra cost, but not to the extent suggested.

The last witness was Mr. Hugh C. Godfray, Solicitor for the North Metropolitan and several more Tramways Companies, and a Director of some others. Until the Ilford case, he had never heard of a demand for lateral movement being made, except where there was an insufficient depth for the mains—as, for example, in crossing over a bridge. So far as he knew, the Ilford case was without precedent. The question of extra cost of work due to the presence of tramways constantly arose; and in all cases his Companies had paid them. In the case of the New River Company, they had a give-and-take arrangement which had worked well for many years. It was a similar plan to that adopted by the vestries, who restored pavements for gas and water companies, and made a charge.

Speeches of Counsel.

Mr. Danckwerts, before addressing the Arbitrator for the Corporation, said he was instructed to repeat what had always been conceded by his clients, and to say that they did not in the least recede from that position. The Corporation were willing to undertake (as they had always been, and had offered) to lower all gas and water mains which they might in the course of the construction of the tramway hereafter discover lying underneath the track, to a depth of 2 feet from the surface of the roadway, in the event of such pipes not already being laid at that depth; it being understood that this undertaking was not to cast any obligation on the Corporation to excavate to any greater depth than was needed for the construction of the tramway for the purpose of endeavouring to discover the pipes. This was what they had been willing to do all along. He then proceeded to deal with the Ilford case, which he said did not decide in the least what it had been assumed to decide. The proper construction of the Act was not put before the Court in that case. Mr. Cripps had stated that the whole of the present case was one of access, and nothing but access; and should the Arbitrator find it necessary to deal with it as an access case, he (Mr. Danckwerts) should ask him to put his award in the form of a special case, so that they might clear up the question of law and clear up any difficulty which was caused by the Ilford case. Of course, the Ilford case came before the Court in a very peculiar manner. There was no appeal upon a question of law from an Arbitrator, unless it was one of jurisdiction. If he had been within his jurisdiction, no matter how erroneous the law which he had considered and directed himself according to, the Court could not in the least correct that. Learned Counsel then discussed the Ilford case at length, and contended that Major-General Hutchinson (the Arbitrator), rightly or wrongly, found as a fact that there was an element of danger involved. Therefore, his jurisdiction attached; and the Court could not say that the particular way in which he dealt with the consequences of that danger was not within his powers. In the present case, he had all along been struck by what he might call the anxiety which was manifested on the other side to, as it were, protect the West Ham Corporation against the West Ham Corporation. The first paragraph of section 30 of the Tramways Act stated that: "For the purpose of making, forming, laying down, maintaining, repairing, or renewing any of their tramways, the promoters may, from time to time, where, and as far as it is necessary, or may appear expedient"—there was a distinction drawn in that part between necessity and expediency—"for the purpose of preventing frequent interruption of the traffic by repairs or works in connection with the same, alter the position of any mains or pipes for the supply of gas or water, or any tubes, wires, or apparatus for telegraphic or other purposes, subject to the provisions of this Act, and also subject to the following restrictions." In other words, it became necessary for the tramway people to say whether they thought it either necessary or expedient in their own interest to prevent frequent interruption of the traffic by repairs or works in connection with the same to alter the position of any gas-main. Here the Corporation had considered both the necessity and expediency, and had come to the conclusion that it was neither necessary or expedient, so far as their purposes were concerned, to move them. All the Arbitrator had to consider was whether it was necessary. As regarded the East London Water Company, the communication pipes did not belong to them; and the persons who ought to be before the Arbitrator with regard to existing communication pipes were the houseowners. With reference to the Gas Company, he thought he might accept it that the service-pipes belonged to the Company, and consequently the position was different. As to the facts, in all the streets where the concrete was already laid, the question could not possibly arise except as regarded the addition of the rail and the cross ties. The Corporation might have laid down the concrete under the Public Health Act entirely; and then the arbitration would not have arisen. The street was to be concreted all over, and therefore it would not be any use moving the pipes laterally. Then what difference did the rails make? He submitted that at the very most it was a difference of the increase of cost; and the numerous practical people they had called had conclusively shown that the suggested difficulties caused by the presence of the rails had no existence at all really. It might be an increase of cost; but if it was a mere question of cost, there was no question of necessity. Cost did not increase the necessity, especially when it did not fall on the person whose necessity it was supposed to be. Therefore he submitted there was really no case at all. As to the suggested duplication of the mains, there was not one word in the Act about laying new mains.

Mr. Cripps, for the East London Water Company, said the most important point, and the difficult point, although it seemed in substance decided by the Ilford case, arose as regarded the relationship between the parties—the tramway authority and any such company as a water company—under sections 30 and 32. In other words, it was necessary to reconcile the position, as regarded sections 30 and 32, and to show that they had come at the right time to get some general direction such as they were asking for. What was the real meaning of the Ilford case? There were two directions in which, apparently, it was thought there might be difficulty of access, thereby interfering with the convenience of supply; and in his finding, the Arbitrator first of all awarded the lowering "to a sufficient extent to permit of service-pipes between this main and the houses on the side of the tramway remote from the main being laid so as to enable these service-pipes to be carried horizontally under the bottom of the trench in which the electric conduits are placed without having to cut through any concrete which may be used under the bottom of such trench." Then, secondly: "In those cases where the position of the gas-main is underneath the tramway, or so close to it that access to the gas-main could not be conveniently effected without interference with the tramway, the gas-main shall be moved laterally to such a distance as to enable such access to be obtained without interference with the concrete trench under the tramway." When they came to the Lord Chief Justice's decision on the case, it was perfectly clear, as a matter of jurisdiction—which was the main point argued in that case—that the Arbitrator was not limited to the question of injury to the pipes, or physical interference with them, but was to consider the convenience as regarded future access for supply purposes. Of course, the Ilford case did not bind the Arbitrator at all. Passing on, Counsel said it was quite wrong to argue that the tramway traffic could be stopped for the purpose of conveniently dealing with repairs to pipes. There was power to stop the traffic in cases of absolute necessity, but not simply for convenience. His witnesses had stated that if the traffic could be stopped there would still be considerable interference; but this would be enormously enhanced if his view was correct, and they could not stop the traffic for repairs.

Addressing the Arbitrator on behalf of the Gas Company, Mr. Moon referred to the offer made by Mr. Danckwerts on behalf of the Corporation, that where, in the course of the excavation, which was only an excavation of 1 foot below the road, pipes of the Gas Company were discovered, they would be lowered until they were 2 feet below the surface of the road. It was, he said, not proposed by the Corporation, even in cases where mains had to be lowered, to deviate them. Admitted that in some cases the mains might have to be lowered, were there not instances in which it was to everybody's interest that they should be not only lowered but deviated too? Of course, he did not accept his learned friend's suggestion on behalf of the Corporation that only those mains should be dealt with which were found in the course of the 1 foot excavation, because his own admission showed that all pipes ought to be lowered to the extent of those when they were lowered 2 feet below the surface; otherwise he would not have given an undertaking to lower those which he did discover to the extent of 2 feet. Therefore he should submit that, on their own showing, where pipes were within 2 feet of the surface they ought to be lowered; and, in the exercise of the Arbitrator's discretion, to be deviated laterally, and deviated in everybody's interest, if they had to be moved at all. Of course, it might be in some cases that there were pipes even more than 2 feet from the surface which ought to be deviated laterally to afford convenient access; but where they were less than this depth, they must be dealt with in some way.

The Arbitrator: "It has all along been admitted by the parties: 'True, there may be inconvenience, but that can be measured in money,' and it is only a question of time. As Mr. Eaton said, at Sheffield they do it at three times the expense at night. What is easier in the world than that you should be paid three times the expense?"

Mr. Moon: "Most things, no doubt, can be met by money; but it is yourself only that would have power to alter the removal."

The Award.

After reciting the sections of the Tramways Act of 1870 bearing upon the proceedings, and the circumstances under which he came to be appointed Arbitrator between the parties, Mr. Lyttelton decided that the Corporation ought not to be required, before laying down the tramways, to execute all or any of the alterations suggested to the Companies' pipes, &c. He also directed that the Companies should pay the Corporation their costs of the reference and of the award.

OMAGH GAS-WORKS PURCHASE.

The Omagh Urban Council had before them at their last meeting several matters relating to the acquisition of the gas-works of the town. The Special Gas Committee reported that they had arranged to obtain on loan from the Ulster Bank a sum of £1788 2s. 10d., which was the amount of the taxed costs involved in opposing the Gas Company's Bill in Parliament and obtaining the Bill promoted by the Council. The loan, which was to bear 4 per cent. interest, would be repayable in ten half-yearly instalments of principal and interest; the first payment to be made on the last day of February next. The loan was formally sanctioned; the Chairman remarking that everything was now in order for the Council to take up the proper working of the concern. A member who had given notice to rescind a previous resolution by which it had been determined to traverse the Arbitrator's award fixing the purchase price of the works was not present to move his motion, and the matter was adjourned.

The question was also naturally referred to at the ordinary meeting of the Gas Company on the 4th inst. The Chairman (Dr. Fleming) remarked that the shareholders would see from the short report which had been issued to them that the Arbitrator had upheld his first award of £26,880. This amount the Directors considered a fair award, but by no means more than they were entitled to, considering the value of the undertaking. Mr. J. Hepworth, their Consulting Engineer, was then asked to give his views on the prospects of the works; and he said he could reiterate what the Chairman had stated. The works were in capital condition, and were being well managed; and they could all look forward to this year being still more prosperous than the last, whether for the Company or for the town. The sale of the works had been forced on the Company; but, at the same time, when the town was determined to have the gas supply in its own hands, he could honestly say that it was getting an undertaking which, if it were well managed (and there lay the *crux* of the whole matter), would in a very short time clear its own way. The amount which the Company had been awarded was not more than 24 years' purchase of their present profits; and this was a low price compared with transfers elsewhere. If he were to give his evidence again to-morrow, he would not abate one penny from what he had previously stated as the value of the undertaking. He considered the town was getting a thoroughly good investment; and the Company were securing a sum which, while not full value, was one they could accept. The Directors' report and balance-sheet were then adopted, and the standard dividend of 5 per cent. was declared.

HESSLE DISTRICT COUNCIL AND THE GAS-WORKS.

The question of the advisability of acquiring the undertaking of the Gas Company was further discussed at the meeting of the Hessle Urban District Council on Monday last week. Correspondence was read from the Council's London Agents and from the Gas Company; the latter now stating that they did not desire to sell their undertaking, and that it was their intention, prior to the Council approaching them with the view to purchase, to apply for statutory powers, and that a Provisional Order or Act would be promoted in the ensuing session. Having regard, however, to the powers possessed by local authorities with reference to the supply of gas, and the possibility of the Council being able to impose on the Company an obligation to sell when statutory powers were applied for, the Directors would not, except with regard to the terms of purchase, oppose the insertion of a clause in their Order to enable the Council to purchase the undertaking compulsorily on proper terms, on condition that the Council would undertake not to oppose the Company's application, either before the Board of Trade or in Committee, except for the purpose of settling the terms of the purchase clause if not previously agreed upon. As the Council were not at present in a position to make a binding contract to purchase the undertaking, the Directors were advised that this would place the matter upon a proper basis. Further than this they were not at present prepared to go. After some remarks, it was decided that the Company's letter should be submitted to the Council's Agents for their comments, and that a special meeting be held to deal with the matter. Meanwhile, a deputation from the Council will wait upon the Company to confer with them.

SOUTHPORT CORPORATION GAS UNDERTAKING.

The Supply of Gas-Cookers.

With reference to the proposed application by the Southport Corporation Gas Committee for permission to borrow a further £5000 for the purpose of providing gas-cookers, &c., briefly referred to in the "JOURNAL" last week, it may be noted that since 1895 the sum of £16,500 has been borrowed for this purpose—viz., £10,000 under the Provisional Order of that year, and two sums of £5000 and £1500 under the Order of 1899. Of the first loan, £6155 has been paid off; while of the second, £1348 has gone to the sinking fund. At the monthly meeting of the Town Council on Tuesday, Mr. Boyd objected to the part of the application which referred to "heating purposes." He said this matter had been discussed with the master ironmongers and gas-fitters in the town, and he understood the Gas Committee came to an understanding with them not to enter into competition in regard to heating by gas. He should like to know whether the Committee still intended to carry on the competition. Mr. Trounson (the Chairman of the Gas Committee) said that none of the money was intended to enable the Committee to indulge in competition by means of gas-fires, but was simply for cooking purposes. Mr. J. Hatch said that it seemed to be a very large sum to ask for; and he should like to know why it was required. The capital expenditure on the cookers was already considerable. He knew that plenty of them in the houses were not being taken care of; he considered there should be some regard paid to their inspection. Mr. Holland thought the gas-stove business might be worked by arrangement with the various gas-stove makers without the Corporation putting their hands into their pockets. Mr. Trounson, in reply, said the cookers were being well looked after, and the Committee had inaugurated a system by which every one, as well as the consumers' fittings, in the whole of Southport and Birkdale, was being inspected by their own men specially told off for the purpose. The matter had exercised the minds of Gas Committees all over the country; and the idea that it did not pay to provide gas-cookers was entirely exploded. With regard to the general upkeep of these appliances, the borrowing powers of the Corporation were limited to ten years. The bulk of their gas-cookers were as good to-day as when they were bought. He was satisfied that, with the ordinary treatment they received in Southport, at the end of ten years they would be almost equal to new; and he hoped the time would come when they would not require £5000 but another £20,000 for the same purpose. During the past six weeks they had taken orders for 1200 of one type of cooker—the slot cooker—and he did not know any other town in England that had done this in the same period; though they had put forward extra efforts. The recommendation of the Committee was agreed to.

THE DEVONPORT WATER ARBITRATION.

A long time seems likely to still elapse before a final decision is reached in the matter of the Devonport Water-Works arbitration. The death of Sir Frederick Bramwell interrupted the proceedings at the stage when his decision as Umpire was about to be given; and though Mr. A. J. Ram, K.C., the new Umpire, has applied his attention to the case with much assiduity, he has naturally required considerable time in order to become acquainted with the details, which involve points of considerable complexity. Fortunately for those on whom the burden of the costs will fall, Mr. Ram did not find it necessary to recall the witnesses who gave evidence before Sir Frederick Bramwell. This was at one time thought to be inevitable; but Mr. Ram came to the conclusion that the full record of the witnesses' examination, supplemented by personal inspection of the works, would put him in possession of all that could possibly be learnt on the points requiring his attention; and to this, as already reported in our columns, both parties agreed. The inspection was carried out two or three weeks ago; the Umpire being accompanied over the works by Mr. H. Francis, the Engineer to the Water Company, and by Mr. Lillicrap, the recently appointed Engineer to the Devonport Corporation. Last week Mr. Ram made his award in blank, and it was submitted to the Solicitors acting on behalf of the Company and the Corporation. When they and Counsel have satisfied themselves that no point has been overlooked, the award will be returned to Mr. Ram for the figures to be filled in. When the award is finally delivered, a legal point of considerable importance will remain to be argued in the Law Courts. This is the bearing on the valuation of the undertaking of the conditions under which a supply of water is furnished to the Admiralty; and as it is possible that this matter may be carried to the House of Lords, December, 1905, is now named as the earliest probable date at which the works will be transferred to the Corporation. Mr. Ram's appointment as Umpire, although it has caused delay in one direction, has had the effect of narrowing the legal issues originally reserved for decision by the Law Courts. Two points relating to back-dividends which Sir F. Bramwell was to leave for judicial decision have been considered by Mr. Ram, and effect will be given to them in his award.

RICHMOND (SURREY) WATER SUPPLY.

The Negotiations with the Metropolitan Water Board.

In the report of the proceedings at the Meeting of the Richmond (Surrey) Town Council on the 2nd inst., which appeared in the "JOURNAL" last week, it was stated that a special report had been prepared by the Chairman of the Water Committee (Alderman Roberts) and the Town Clerk (Mr. F. B. Senior) in reference to the acquisition by the Corporation of the water-works and plant in the parishes of Kew, North Sheen, and Petersham, and the right to supply water, as vested in the Southwark and Vauxhall Water Company, and also to the reduction in the price of water supplied in bulk to the parish of Richmond. The report was a voluminous document, the preparation of which must have involved a large amount of labour upon the compilers. After setting out the principal points involved in the negotiations, the results obtained were summarized as follows.

1.—Abandonment by the Water Board of their proposal that Richmond should pay a proportionate part of the total amount of the purchase-money of the Southwark and Vauxhall Water Company's undertaking, in the same ratio as the population and rateable value of the added Richmond area bear to the total rateable value of the Southwark and Vauxhall Company's whole district. Had the Water Board's suggested basis been adopted, the purchase-money would have been increased by many thousands of pounds.

2.—Adoption of the principle contended for by the Corporation's professional advisers—viz., that the basis of calculation for the purchase-money should be the capitalized value of the net revenue derived from water-rents in the added area of Kew, North Sheen, and Petersham, and that the Corporation should be entitled to be supplied in future by the Water Board with a sufficient quantity of water for the requirements of the added area at the prime cost of pumping, filtering, and delivering water to the districts on the constant system.

3.—A reduction in the price asked by the Water Board (after they had consented to the principles demanded by the Corporation) from £50,000 to £35,000.

4.—The settlement of the price to be charged by the Water Board for the supply of water in bulk to Old Richmond was 6d. instead of 1s. per 1000 gallons, the terms now agreed upon for the supply of water by the Water Board to the Corporation being set out in the agreement of May 18, 1904, section 2, as follows: "The Board shall, from the appointed day, supply to the Council water in bulk for use within the said borough upon the following terms: The Board shall, if required by the Council, supply 150 million gallons per annum; and the Board shall also, if required by the Council, supply such further quantities of water in addition to the said 150 million gallons per annum as may be fixed by agreement, or in default of agreement by arbitration. The price to be paid by the Council for such supply shall be for the first 75 million gallons the cost price to the Board, which is now agreed at 2d. per 1000 gallons; for the second 75 million gallons, the price shall be 6d. per 1000 gallons; and for any further quantities beyond 150 million gallons, it shall be 6d. per 1000 gallons."

5.—The Corporation acquire, in addition to the exclusive right to supply water in future to the whole of the borough, including the added area, in perpetuity, the whole of the mains within the borough necessary to maintain the supply. The obligations of the Water Board are also of a permanent character. Certain questions, however, more particularly as to the prime cost of the water, may, at the instance of either the Corporation or the Water Board, be revised within seven years; but it is expressly provided that the prime cost shall in such case be limited to the cost of obtaining water from the River Thames only—thus safeguarding the inhabitants of Richmond from having to bear any portion of the burden of the cost of obtaining water for London hereafter from other and probably distant sources.

COLNE VALLEY WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Bushey, on the 2nd inst.—Mr. C. E. KEYSER in the chair.

The SECRETARY (Mr. W. Verini) having read the notice of meeting, the report of the Directors, the principal features of which were dealt with in the "JOURNAL" for the 26th ult., was taken as read.

The CHAIRMAN, in moving the adoption of the report, first explained that his occupancy of the chair was temporary, due to the fact that Mr. J. R. Holland was obliged to leave England for family reasons, and then passed on to deal with the accounts. The first thing he had to bring under their notice had reference to the water-rates. The total amount for the half year to the 30th of June was £16,162; whereas the item for the corresponding half of 1903 was £14,869. Comparing the one half year with the other, they found that there was an increase of £1293. Only once before had the increase been so large in the corresponding period, and that was in the six months ending June 30, 1899, when it reached the total of £1430. During the half year, 324 new supplies had been added to the Company's books; and they were estimated to yield a total annual water-rental of £837. This was about equal to the average of the last few half years. With regard to building supplies, at the meeting in February it was mentioned that the amount received for these in 1903 was £250 less than the average; but since then building operations had been going on apace, and the total received was £626, being a record half year. The previous largest amount was £616, in the first half of 1899. Coming to the expenditure, the total cost of maintenance and management was £6495, against £6208 for the same period in 1903—being £287 more, of which £126 was accounted for by increase in rates and taxes. As to the supply of water, the total quantity pumped was 378 million gallons, against 380 millions in the preceding half year and 352 millions in the first six months of 1903. The population was about 71,000; and the average per head per diem for domestic supplies was about 23 gallons as usual. The Directors were able to propose a dividend at the rate of 8 per cent. per annum on the 10 per cent. maximum shares; thus keeping up the increase of ½ per cent., which had been the average annual rise since 1898. To pay this 8 per cent., and the dividend on the 7 per cent. maximum shares, would absorb £8078. When they had reached the maximum 10 per cent., they could begin to pay back-dividends on both the 7 and the 10 per cent. shares; but they had to work up to this before they could do anything more with the 7 per cent. shares. The payment of the proposed dividend would leave them with a balance of £943 12s. 7d. to carry forward. As they had placed a further £500 to the contingency fund, he did not consider any of their friends would think they were doing anything rash in suggesting this dividend of 8 per cent.

The VICE-CHAIRMAN (Mr. A. Helsham Jones) seconded the motion; and, after a few remarks by shareholders, it was carried unanimously.

The dividends recommended were then declared.

Mr. HEPBURN moved a vote of thanks to the Chairman, Directors, and staff, including the Resident Engineer (Mr. Blackburn).

Mr. SNARE seconded the motion, and it was carried unanimously.

The VICE-CHAIRMAN briefly thanked the shareholders, and the meeting concluded.

DERWENT VALLEY WATER SCHEME.

Visit to the Works.

On Monday last week, a visit was paid by a large party, composed of members of the Sheffield Corporation and others, to the works of the Derwent Valley Water Board. Among those present were the Chairman of the Board (Alderman Gainsford), the Chief Engineer (Mr. E. Sandeman), the General Manager of the Water Department of the Corporation (Mr. W. Terrey), the Engineer (Mr. L. S. M. Marsh), and the Engineer at Langsett (Mr. W. Watts). The visitors were conveyed by special train from Sheffield; and on arrival at Bamford they were divided into two parties. On reaching the Derwent reservoir, they spent an interesting and instructive 40 minutes in viewing the work that has been accomplished and is in progress, and in listening to the explanatory details given by Alderman Gainsford. Of considerable interest was the "fault" which has caused the Engineers so much trouble. It is a curious convulsion of the strata—a wrinkle or contortion which runs down the whole length of the valley. There are many theories to account for it; but the one most generally accepted is that it is due to the enormous weight of the hills on either side of the valley pressing towards the centre, until the strata had been broken and forced upwards. This was a difficulty which caused much anxiety; and it became necessary to go to a very great depth in order to reach good solid rock that would be impervious to moisture. The reservoir will be 1¾ miles in length, will cover 168 acres, and have a capacity of 2000 million gallons of water. The dam in course of construction will be 1110 feet in length, with a maximum thickness at the bottom of 160 feet.

From the Derwent reservoir the visitors went on to the Howden reservoir—the uppermost of the two—where operations have reached an interesting stage. The work was started in 1901. A huge gap, about 180 feet wide, has been excavated across the valley through which the Derwent flows along a diverted course; the foundations having been sunk to a depth of 68 feet below the river bed. Considerable difficulty was also experienced here in finding a sound rock bed bottom on which to erect the masonry dam. A satisfactory basis was eventually reached in the Youldale series of the carboniferous system. As a precautionary measure, to prevent water from percolating under the main body of the dam, a narrow trench, 6 feet wide, has been sunk on the north side of the foundation of the dam. This is carried down a further 20 feet, and is to be filled with concrete; the object being to form a water-tight concrete apron. The cutting of the recess for the narrow trench was done by two steam drilling machines, which made lines of holes 2 inches in diameter and a foot deep. An adaptation of the Lidgerwood overhead cable system is in use at both dams. Two heavy steel cables, each 7 inches in circumference—the largest spans being 1525 feet—stretch across the valley at a height of 150 feet above the river. They pass over timber towers at either side, and are firmly secured to the solid rock of the hill. Along the cables is worked an endless rope, having attached to it a trolley, from which is suspended an iron skip for the reception of the material as it is removed. The pulley carriage, over which the endless rope passes to the drum, can be moved sideways within a distance of 50 or 60 feet, and by this means the skip can be lowered to the precise part of the trench where it is required. When full, the skip is quickly raised into the air and drawn across the cable to the bank. The Howden dam is designed to form a reservoir having a water area, when full, of 157 acres, and a capacity of 1886 million gallons. The lake formed will be a quarter-of-a-mile in length. The dam, in common with all the others included in the scheme, will be of millstone grit, in large rough blocks; the spaces between being filled with concrete.

On the return journey, a visit was paid to the Board's village at Birchinlee, the population of which is between 2000 and 3000. All the navvies and workmen live there; and there are public buildings of all kinds. The journey being resumed again, the party reached Ashopton, where tea was provided by Alderman and Mrs. Gainsford, to whom a hearty vote of thanks was accorded. In expressing the thanks of the officials of the Water Department, Mr. Terrey said it was not his intention to dwell upon the great interest Alderman Gainsford had always taken in forwarding everything relating to the progress and welfare of the city of Sheffield, his interest in the development of its water supply, or his ability, which had secured for Sheffield for the next forty or fifty years a pure, abundant, and cheap supply of water, upon which the prosperity and development of the city so largely depended, but he merely wished to refer to the kindness he had always manifested towards every member of the staff of the water undertaking, upon whose loyalty and zeal he might always depend. His (Mr. Terrey's) only object was to express, on their behalf, their sincere thanks for the kindness of Alderman and Mrs. Gainsford in including the whole of the members of the staff in the invitation, and for giving them the advantage of inspecting the works, and spending so pleasant and interesting an afternoon. Alderman Gainsford, in returning thanks, said the present was a very opportune time for viewing the works, because the visitors could see them in a most interesting stage, and appreciate the extent of the excavations. The dams would be built up step by step; but the whole scheme would not be finished for some years.

TORPOINT DISTRICT WATER SUPPLY.

Attention is again being directed to the necessity of providing an additional water supply for Torpoint and its neighbourhood. The Urban District Council were informed last week by the authorities of Devonport Dockyard that the erection of the new works in connection with the proposed gunnery establishment will commence next year, and a supply of 75,000 gallons of water a day will be required. The existing works are not capable of affording anything like this quantity and providing at the same time for the wants of the town; and a new scheme will have to be carried out. An attempt to deal with the matter was made by the St. Germans Rural District Council—in whose district Torpoint was formerly included. But difficulties arose; and in January last, in view of the separation of the Torpoint district then pending, it was decided to drop the matter. The idea of the St. Germans Council was to provide a scheme which would serve a wide area, the most populous parts of which are Torpoint and Saltash. Mr. G. R. Strachan was consulted, and he prepared a scheme which the Council agreed with, but which rather frightened them when they came to consider the question of cost. The source of supply chosen by Mr. Strachan was the Withey Brook, at Hawkstor Down, 24 miles from Torpoint, the average yield of which is 6 million gallons per day. Alternative estimates of the cost were submitted. In order to provide a supply of 120,000 gallons a day for Torpoint alone, the cost was

estimated at £21,500; while increasing the size of the main to deliver 200,000 gallons a day would bring the cost up to £26,000. If the supply was increased to 300,000 gallons daily, and a branch main to Saltash was included, the cost would be £34,500. When Mr. Strachan found that the St. Germans Council could not proceed with the matter, he formally withdrew from the position of Engineer. His scheme, however, remains; and an attempt is now to be made by the Torpoint District Council to induce the Saltash Corporation to join in giving effect to it. Saltash is at present supplied with water by the Plymouth Corporation; but the agreement will expire shortly, and the Saltash Town Council will then be in a position to enter into a new arrangement. Mr. Strachan's calculations of the annual cost of his scheme were based upon the assumption that the money could be borrowed for 50 years, and that the rate of interest would not be more than 3½ per cent. On this basis, the cost of providing 120,000 gallons of water per day works out at £1440 per annum, and that of the larger scheme of 300,000 gallons at £2400. It is probable, however, that the Local Authorities would have now to pay a little more in the way of interest on the money.

RIVINGTON WATER-WORKS ARBITRATION.

Monday, July 11.

(*Before Mr.* R. E. MIDDLETON, M.Inst.C.E., *Umpire.*)

At the Surveyors' Institution to-day, arbitration proceedings were opened to determine the amount to be paid by the Corporation of Liverpool to Mr. W. H. Lever, of Lever Bros., Port Sunlight, for a portion of his estate at Rivington. In 1900, Mr. Lever acquired 2100 acres of land in the Rivington watershed for £60,000, and subsequently presented 865 acres to the town of Bolton as a public park. Reserving 41 acres for his own use, there were left 1687 acres which the Corporation of Liverpool seek to acquire to protect their watershed and maintain the purity of their water supply. Mr. Lever, however, required £457,000 from the Corporation for these 1687 acres—which is more than seven times the price he paid for the whole 2100 acres; and as the Corporation thought this sum exorbitant, the matter was referred to arbitration—Mr. R. VIGERS acting for the Corporation, and Mr. E. BOYLE, K.C., for Mr. Lever.

Mr. BALFOUR BROWNE, K.C., Mr. PICKFORD, K.C., and Mr. F. E. SMITH appeared for the Corporation; Mr. H. ASQUITH, K.C., M.P., Mr. T. G. HORRIDGE, K.C., and Mr. E. HONORATUS LLOYD, K.C., represented Mr. Lever.

Mr. ASQUITH, in opening the case, said Mr. Lever came before the Umpire to ask him and the Arbitrators to fix the value of the land which the Corporation of Liverpool had given notice to purchase under an Act passed in 1902. The Corporation had many years ago, under a scheme prepared by the late Mr. Thomas Hawksley, erected waterworks at Rivington; and finding them insufficient for their needs, had gone to Vyrnwy. The area of supply of the Corporation was very large—115 square miles; and the population supplied from the waterworks numbered a million. Not only were the Corporation of Liverpool supplied, but twelve other local authorities. At Rivington, near Bolton, the Corporation had constructed eight reservoirs, extending in a chain 5½ miles long, and the water area of the reservoirs was 600 acres. The Corporation purchased the land for the reservoirs, but left to Providence or gravitation the duty of sending the water into them. They realized the precarious and dangerous state of things—precarious because they had no control over the water supply, and dangerous because of the risk of contamination. The Corporation went to Parliament after making some small purchases privately, to obtain power to buy up the remainder of the Rivington watershed. Mr. Lever came into possession of more than 2000 acres of land in the watershed in this way: He heard that Mr. Crompton's estate was in the market; and, being a native of Bolton, and having an idea of benefiting his native town by presenting to them a park, he made an offer of £60,000 for the estate. He then heard that the Liverpool Corporation, who he thought were the natural people to buy it, were in the market; so he withdrew his offer. Being told, however, that the Liverpool purchase was abandoned, he renewed his offer, and it was accepted. His object was to present to Bolton a park and also Rivington Pike, to build a bungalow for himself, and develop the district as a residential estate. He also purchased another 120 acres of land for about £12,600. The Corporation thus desired to acquire altogether some 2260 acres of Mr. Lever's property. In December, 1901, Mr. Lever made known his intention of giving to Bolton 400 acres for a park; but the Corporation scheduled the whole of the area, as well as the rest of Mr. Lever's property. The Act of 1902 provided that the Corporation should have the land to be given to the Bolton Corporation, and Mr. Lever could lay out the park if he pleased; the Corporation to maintain it. Mr. Lever was also to retain his bungalow and 48 acres of land round it. Mr. Lever improved the roads on the estate at a cost of £10,685; and at the time of the notice to treat he was under contracts, which had not been completed, to spend another £5000. He had spent altogether on the estate £107,372, not including the park, on which he had laid out £15,000, and the bungalow, which had cost him £11,000. Mr. Lever claimed £457,000 from the Liverpool Corporation. The property had valuable amenities, and was in the midst of a growing district. Bolton had a population of 170,000, and was increasing year by year. Horwich was even nearer; and within a 10-mile radius there existed a population of 250,000. Counsel put it that for building purposes for good classes of houses the estate was an ideal one, and valuations would be put in to the effect that the land was worth £140,000, and the water on it, to which Mr. Lever had the right, £50,000.

Mr. *Lever* was then called, and, in answer to Mr. HORRIDGE, stated that he first heard in July, 1899, that there was a possibility of purchasing the Rivington Estate. It was then owned by Mr. Crompton, whose agents, Messrs. Windhurst, told his agent (Mr. Thompson) that the Liverpool Corporation might want the land. He stipulated

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 449.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
510,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	19½–20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 12	6½	Bombay, Ltd. . . .	6–6½	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4⅝–5¼	..	4 18 11
380,000	Stk.	Aug. 12	12	Brentford Consolidated	236–241*	..	4 19 7
300,000	,,	,,	9	Do. New . . .	177–182*	..	4 18 10
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125–130*	..	3 16 11
206,250	,,	June 30	4	Do. 4 p.c. Deb. .	102–105	..	3 16 2
220,000	Stk.	Mar. 10	10½	Brighton & Hove Orig.	212–217	..	4 19 1
246,320	,,	,,	7½	Do. A. Ord. Stk. .	150–155	..	5 0 0
460,000	20	Apl. 14	10	British.	39–40	..	5 0 0
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	114–118*	+1	5 1 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88–93*	+½	4 16 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd	10⅞–11¼	..	6 4 5
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
150,000	20	July 14	8¼	Cagliari, Ltd. . . .	21–23	..	7 3 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51–53	..	5 13 2
1,375,000	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	110–114	..	4 11 3
536,485	,,	,,	5	Do. 3½ p.c. do.	106–109	..	4 11 9
442,947	,,	June 10	3	Do. 3 p.c. Deb. do.	85–87	..	3 9 0
800,000	Stk.	June 10	7	Continental Union, Ltd.	105–110	..	6 7 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	140–145	−2	4 16 7
575,000	Stk.	Feb. 25	5⅛	Crystal Palace Ord. 5 p.c.	118–123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120–125	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133–138	..	3 12 6
486,090	10	July 14	11	European, Ltd. . . .	19–20	..	5 10 0
354,060	10	,,	11	Do. £7 10s. paid	13–14	..	5 17 10
15,243,200	Stk.	Aug. 12	4⅛	Gas-light and Coke Con. Pref.	93–95*	..	4 12 8
2,600,000	,,	,,	3⅜	Do. 3⅜ p.c. max.	86–88*	..	3 19 7
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	106–109*	..	3 13 5
4,193,975	,,	June 29	3	Do. 3 p.c. Con. Deb.	87–89	..	3 7 5
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92–97	..	5 3 1
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15–16	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental .	202–205	..	4 17 7
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95–98*	..	3 11 4
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	Feb. 25	10	Liverpool United A .	217–218	..	4 11 9
718,100	,,	,,	7	Do. do. B .	162–164	..	4 5 4
306,083	,,	June 29	4	Do. do. Deb. Stk.	106–108	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼–4⅝	..	5 3
560,000	100	Apl. 5	5	Met. of 5 p.c. Deb.	102–105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103–102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd. . .	9–10	..	7 0 0
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	104–105*	..	4 5 9
406,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92–92½	..	3 15 8
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	140–145	+2	5 10 4
600,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5⅛–6⅛ *Ex div.	..	5 12 0
235,005	Stk.	—	6½	Ply'mth & St'house 5 p c	—	..	—
851,070	10	Apl. 28	7	River Plate Ord. . .	10⅞–11½	..	6 4 5
300,000	Stk.	June 29	4	Do. 4 p.c. Deb..	93–95	..	4 4 3
250,000	10	Mar. 29	7	San Paulo, Ltd.. . .	11–12	..	5 16 8
135,000	Stk.	Mar. 10	10	Sheffield A	237–239	..	4 3 8
209,984	,,	,,	10	Do. B	256–238	..	4 4 0
523,498	,,	,,	10	Do. C	234–236	..	4 4 9
116,106	Stk.	—	5	Shrewsbury Ord. 5 p.c.	—	..	4 10 11
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	124–126*	+¾	4 7 3
1,832,700	,,	July 14	3	Do. 3 p.c. Deb. . .	87–89	..	3 7 5
380,940	Stk.	May 12	5	Southampton Ord. . .	105–110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c.	122–125	..	4 16 0
313,020	,,	,,	4½		97–102	..	4 8 3
182,380	10	June 10	8	Tuscan, Ltd.. . . .	8⅛–8¾	..	9 2 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	56–58	..	5 2 0
745,872	Stk.	Aug. 12	5	West Ham, 5 p.c. Ord.	95–100*	+½	5 0 0
				WATER COMPANIES.			
782,322	Stk.	June 29	12	Chelsea, Ord. . . .	360–370	..	3 4 10
150,000	,,	,,	5	Do. 5 p.c. Pref. .	157–.62	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142–147	..	3 1 3
175,785	,,	Mar. 29	4½	Do. 4½ p.c. Deb. .	135–140	−2	3 4 4
1,720,560	Stk.	Mar. 23	8	East London, Ord.. .	223–228	..	3 10 2
654,740	,,	June 29	4½	Do. 4½ p.c. Deb. .	135–140	..	3 4 4
1,524,288	,,	,,	3	Do. 3 p.c. Deb. .	90–52	..	3 5 3
700,000	50	June 10	12	Grand Junction 10 p.c. max.. 4 p.c. Deb..	135–140	..	4 5 9
310,000	Stk.	Mar. 29	4		122–126	..	3 3 6
708,000	Stk.	Feb. 25	10	Kent	325–335	..	2 19 8
160,000	,,	,,	7	Do. New, 7 p.c. max..	230–240	..	2 18 4
1,043,800	100	June 29	11	Lambeth, 10 p.c. max..	315–325	..	3 7 8
406,200	100	,,	8½	Do. 7½ p.c. max..	230–240	..	3 10 10
350,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb..	120–125	..	3 4 0
500,000	100	Aug. 12	10	New River, New Shares	310–330*	+5	3 0 0
1,000,000	Stk.	July 28	4	Do. 4 p.c. Deb..	120–124	..	3 4 7
902,300	Stk.	June 29	7½	South-wark and Vauxhall Ord. . . . 7½ p.c. max. 5 p.c. Pref. . 4 p.c. A Deb.	280–285	..	2 12 6
126,500	100	,,	7½		215–225	..	3 6 7
489,200	Stk.	,,	5		145–150	..	3 6 8
1,019,585	,,	Mar. 29	4		120–125	..	3 4 8
1,155,066	Stk.	May 27	10	West Middlesex. . .	300–305	..	3 5 7
200,000	,,	June 10	4½	Do. 4½ p.c. Deb. .	133–138	−4	3 5 2
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb. .	89–92 *Ex div.	−2	3 5 3

† Next dividend will be at this rate.

that his name should not transpire in the matter; and he afterwards told Mr. Thompson not to make any offer. Subsequently, however, Messrs. Windhurst told Mr. Thompson that the Liverpool Corporation had withdrawn from the negotiations; and the outcome was that in January, 1900, he made a definite offer, which was accepted in the following March. His object in purchasing the estate was to give the lower lands to Bolton for a park, to make good roads, and develop the property. In 1901, the Liverpool Corporation gave notice of their intention to apply for an Act of Parliament; and in the session of 1902 they promoted a Bill, against which he petitioned. He received no notice to treat till November, 1903; and he sent in his claim the following December. He had not then had his estate valued by experts.

Cross-examined by Mr. BALFOUR BROWNE, witness said he adhered to his claim of £457,000.

Mr. BALFOUR BROWNE: If you get this sum, and seeing that, according to your liberal calculation, you have only spent about £133,000—out of which you have given a park of 400 acres to Bolton—do you not think you would be well paid?

Witness: I do not think you would think so.

You are giving Bolton a park at the expense of Liverpool?—I am not prepared to put it on that basis.

In further cross-examination, witness went on to say that, as Liverpool did not buy the land, he saw the possibility of developing it for building purposes. About 95 per cent. of the stone used for making the roads came from his quarry. He had paid £2394 to his Solicitor for expenses in opposing the Liverpool Corporation Bill. With regard to supplying Bolton with water, he was informed that the Town Council had passed a resolution to take water at 1½d. a gallon. Mr. Thompson was Chairman of the Water Committee.

Mr. *F. W. Thompson*, mining engineer and land agent, of Bolton, said he had acted for Mr. Lever in the purchase of the property. Bolton was in need of a proper water supply. Witness described the work of making the roads after Mr. Lever had bought the property. When the estate was purchased, the farm buildings were in a bad state of repair; the tenants doing repairs, while the rents were low. He had prepared a scheme for laying out the land for residences up to an elevation of 150 feet.

Tuesday, July 12.

Mr. *Thompson*, in further examination, spoke of the value of the water rights on the estate. He said the Bolton Corporation were prepared to take from Mr. Lever 950,000 gallons of water a day at 1½d. per 1000 gallons. It was at that price cheap water to Bolton. Of course, if the Liverpool Corporation desired to sell the water to them, the town would be prepared to pay them the same figure.

Mr. *R. H. Swindlehurst*, the Water Engineer to the Bolton Corporation, said the yield of the area, without touching the water which had got into defined channels, would be 350 million gallons per annum.

Cross-examined by Mr. BALFOUR BROWNE, witness said this scheme was proposed to him by Mr. Thompson. He had been requested to prepare schemes for improving the Bolton water supply, but had not suggested this. He had propounded the Hodder scheme, which would have produced 4½ million gallons a day, but would cost £750,000. He did not know of any agreement with Liverpool which would prevent Bolton taking this water. He did not know a single instance where a person had been allowed to take off the surface water from an authority owning reservoirs in the watershed.

Mr. *Thompson*, recalled, stated that the agreement between the Liverpool and Bolton Corporations said nothing about going into each other's watershed. The Liverpool Corporation were going for their Bill, and it was claimed by Bolton that the watersheds overlapped, and by agreement the boundary was pegged out.

Cross-examined by Mr. BALFOUR BROWNE, witness said he did not know that Mr. Crompton's estate was for sale until Mr. Lever instructed him. He was then bound to that gentleman, and as Chairman of the Bolton Water Committee he was not in a position to suggest that the estate should be bought by them for its water.

Mr. *Henry Rofe* gave evidence as to the value of the water on the estate, which he put at £48,385.

Mr. *T. Taylor Wainwright* estimated the value of the land to be acquired at £133,030, and the water rights at £49,460—together, £182,490.

In cross-examination, he said there had been a slump in grouse moors of late, but he believed it to be only a temporary one, and with a revival in trade the former values would again be reached. His calculations were that 2500 houses could be erected on the estate, and they would accommodate 13,000 people.

Mr. *W. H. Wellstead* put the total value of the estate—land and water rights—at £181,844.

Wednesday, July 13.

This morning, three witnesses were called to speak to the value of the property in question. Mr. T. Fenwick estimated it at £181,193, inclusive of £48,705 water rights; Mr. T. B. Farrington at £180,302; and Mr. C. J. Lomax at £178,368—these two gentlemen putting the water rights at about £50,000. Mr. H. R. Booty, a member of the firm of Messrs. Cooper Bros., gave details of Mr. Lever's expenditure on the estate; the items amounting to £131,488.

This closed the case for the claimant.

(*To be continued.*)

At the meeting of the Southport Corporation last Tuesday, a recommendation of the Gas Committee to increase the salary of Mr. Walmisley, the Assistant Gas Engineer, by £20 per annum, was agreed to. The recommendation was the result of a suggestion by the Engineer (Mr. J. Bond).

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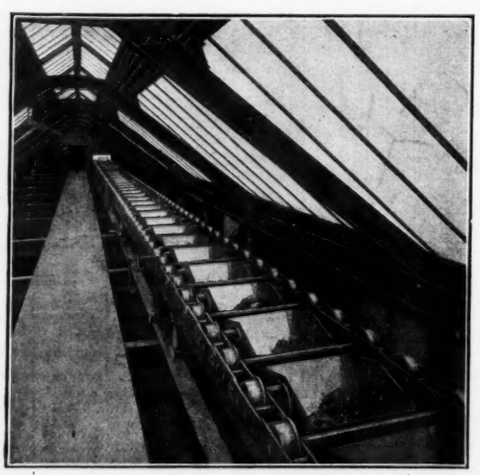

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The valuation of the Perth Corporation Gas-Works formed the subject of discussion at a meeting of the Town Council on Monday. Unfortunately, some unnecessary heat was developed in the course of the argument. Treasurer Lawrie, as the one who keeps the purse-strings, wanted to know why the City Assessor had not been consulted in the matter. Apparently the Gas Committee were to save something like £300, and the Town Council were to lose £200. He moved that the matter be remitted to the Council in Committee. Mr. Cuthbert, the Convener of the Gas Committee, explained that, the gas-works being in two parishes, they required to have the valuation made up by the Assessor of Canals and Railways, whose valuation they were bound to accept, and the matter did not require the attention of the Town's Assessor. As Convener of the Gas Committee, it was his duty to try to have the valuation of the gas-works reduced. Treasurer Lawrie said that under the valuation the town received three-fifths of the sum and the county two-fifths. It seemed to him an extraordinary thing that the Gas Committee should have gone first of all to the Railway Assessor, and should never have consulted the Town's Assessor. The action of the Gas Committee was approved by 15 votes to 8. The Corporation are about to extend the gas offices, at a cost of £1100.

The Corporation of Newport, Fife, having last year removed to new gas-works, are in process of realizing the old ones. At this week's meeting of the Town Council, Mr. Leitch objected to an entry in the balance-sheet relating to the old works; his view being that it was a loss, and should not be entered as an asset. It was pointed out that there was property still left which was sufficient to cover the amount entered, but an endeavour would be made to reduce the sum when the time was more opportune. The Council agreed to a recommendation by the Gas Lighting Committee, under which the Gas Department take over the street-lamps (incandescent) for an annual payment of £247, with 16s. 3d. per annum for each lamp which may be added to the present number. The Councillors were satisfied that the arrangement proposed was a very satisfactory one for the town.

The Peterhead Corporation Gas-Works are enjoying a season of prosperity which is the more gratifying in that it is not the outcome of increase of the community, but of efficiency of management. It was reported to the Town Council on Tuesday that for the year ending May 15 last they had a balance of profit, after paying interest and sinking fund charges, of £465. The Committee unanimously recommended a reduction of 2d. per 1000 cubic feet in the price of gas, with 5 per cent. discount for gas used in lighting and heating, and 7½ per cent. discount for gas used for motive power purposes. Mr. Ritchie, the Convenor of the Gas Committee, said that the forecast of the possible profits from last year's working had been well realized. The revenue from gas sold during the twelve months was £5314, representing a sale of 28,800,000 cubic feet, in addition to which there was a leakage of over 3 million cubic feet. The increase in revenue over the preceding year was £380, indicating an added consumption during the year of nearly 2 million cubic feet. From the sale of residuals there was derived a revenue of £1280—an increase of £104. Their total income was £6654—an increase of £514. An item of £81, derived from the hire and sale of stoves, had been put against the outlay incurred in the fitting up of these and other cooking and heating appliances, which it covered, and left a favourable balance of £8. This sum had been applied in the reduction of capital account. On the expenditure side of the balance-sheet, the largest item was coal, there having been purchased during the year 3492 tons, at a cost of £3012—an increased consumption of 100 tons, the cost of which, all but £2, had been covered by the saving in the price per ton. During the year, they had obtained 92 additional ordinary consumers, making the number now 1372, and 83 consumers with prepayment meters, who now numbered 329; while they had 323 cookers in operation. From prepayment meters there had been collected £573—representing a total of over 123,000 pennies, and an increase of £102 of revenue from that source during the year. Provost Leach complimented Mr. Ritchie upon the grand report he had been able to lay before them. They had, he said, been fortunate with their Gas Managers, and the present Mr. Keillor looked as if he were going to do even better things than his brother had done. The Council adopted the accounts, and agreed to the reduction proposed.

The erection of the new gas-works for Falkirk was begun yesterday. This is quite satisfactory; but there is the surprising element in the business that the work was done without any public ceremony. Simply the workmen of Mr. J. Gardner, who is to build the retort-house and coal-store, set to work by cutting the first sod, by which, it is to be presumed, is meant the preparation of the foundations. Referring to the event, the "Falkirk Herald" says: "It is no very great beginning; but it indicates a stage of progress which has seemed more difficult of attainment as the negotiations dragged their weary length along, as sites were selected only to be abandoned, as agreements were entered into only to be broken, and as decisions on different points were come to only to be overturned." This is really the history of the undertaking. It is to be hoped that these days of difficulty are all past now.

The Gas Committee reported to the Hamilton Town Council on Tuesday that they had received a letter asking for a contribution towards the International Gas Exhibition to be held at Earl's Court, London, and that they had adjourned consideration of the letter. I should not wonder although the Committee may consider the contribution should come from London to them, instead of going from them to London. They are about to exhibit gas cooking and heating appliances at the gas office; and I have no doubt that assistance in that work would be very gladly accepted by them. The Gas Committee recommended that the salary of Mr. J. Ballantyne, the Manager, should be advanced by £30 a year. In speaking to this, Mr. M'Hale, the Convener of the Committee, said the proposal was simply the carrying out

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BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

of an understanding of the Committee with Mr. Ballantyne that if he made the manufacture of sulphate of ammonia a success they would consider the advisability of increasing his salary. As the Council were well aware, the sulphate of ammonia plant had been a greater success than was anticipated; and his own opinion was that the increase of £30 fell far short of the great amount of work and study given to the subject by Mr. Ballantyne. It amounted to less than 2 per cent. on the profits of the new undertaking. Even with the increase, Mr. Ballantyne's salary would still be lower than that of the managers of works in Scotland of similar size and importance. The proposal gave rise, as is always the case, to questions regarding the increase in the wages of the workmen, which brought out the statement I have heard made before, that the workers in the Hamilton Corporation Gas-Works are about the highest, if not the highest, paid in Scotland. The Convener, however, agreed that the Committee should consider the question in regard to the men's wages, and the increase of salary to Mr. Ballantyne was voted unanimously.

Treasurer Mitchell reported to the Lanark Town Council on Monday that he had attended the meeting of the Lanark Gas Company, as he was directed, and tried to enforce upon them the instructions he got from the Council in regard to better gas, but that the Company seemed of opinion that it would be a very difficult job to give better gas. However, he told them these were his instructions; and he even went a little further, and endeavoured to get a reduction in the price of gas, because he thought that the big balance showed that certainly they could afford to grant to the ratepayers a reduction of at least 5d. per 1000 cubic feet, which would make the price 3s. 4d. There was considerable discussion upon this, and he told the shareholders that at least if they could not see their way to grant that reduction all round, there was nothing to hinder them—in fact, it was their duty—to reduce it for the street lighting. After discussion, the shareholders agreed to take the matter into their serious consideration; and, as he had not given notice of motion, he thought it best to leave the matter in the hands of the Company. The Council approved of what had been done by the Treasurer.

The condition of the Galashiels water reservoir at Knowesdean has for some time been causing anxiety to the Town Council. Shortly after the reservoir was constructed, about twenty-five years ago, a leak occurred at the foot of the embankment, by which several hundred thousand gallons of water were lost daily. Recently another and much larger leak has broken out, and the necessity for something being done has become urgent. The Town Council thereupon asked Messrs. J. & A. Leslie and Reid, of Edinburgh, to examine the reservoir and to report as to the best method of dealing with the leakage. A deputation of the Council had a consultation with the Engineers in the early part of this week, and as the outcome of that consultation a special meeting of the Council was held last night, at which it was agreed to empower the Engineers to carry through certain boring operations which are considered to be necessary on the embankment at the reservoir.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 13.

Sulphate of Ammonia.

There has been a fair amount of inquiry; but the greater anxiety of makers to dispose of their output has had the effect of further depressing the market, and the closing quotations are £11 12s. 6d. per ton f.o.b. Hull, and £11 12s. 6d. to £11 15s. per ton f.o.b. Leith and Liverpool. Moreover, the continued speculative offering abroad of near months at the level of spot prices has encouraged buyers to hold off for a still further decline, notwithstanding the relatively low level already reached. Further ahead, makers for the most part remain firm, and their quotations must be regarded as nominal. Neither are speculators venturing to quote prices within reach of buyers, who are endeavouring to get in at near the spot level.

Nitrate of Soda.

This article is steady, and spot prices remain at 10s. and 10s. 3d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Aug.* 12.

Tar Products.

Markets are very quiet, and there is really nothing doing. Pitch is decidedly weak all round; and there is little or no inquiry for either prompt or forward delivery. The general impression is, however, that consumers are holding off the market, and that they have not yet secured their supplies for January-June next year. Should this be the case, there may be an improved demand later in the year. There is certainly more Yorkshire pitch offering for both prompt and forward delivery. Several of the large makers, having evidently renewed their contracts for tar, appear desirous of placing their production for forward delivery. The position of London makes remains unchanged so far as sellers are concerned; but dealers are quoting low prices for both prompt and forward delivery. The demand from South Wales does not seem quite so good as was the case some little time ago; and consumers only offer low prices for forward delivery, although the fuel trade is brisk, and makers do not appear to have any stocks—in fact, in several instances they are pressing for deliveries. Some business has again been done in 90 per cent. benzol at 9d. per gallon f.o.b. London; but in 50-90 per cent., no transactions are reported. There is nothing fresh to advise in anthracene; and the business which was in process of negotiation for all over next year does not appear to have been settled. There are, however, still buyers of "A" quality at 2d. per unit for forward delivery. Solvent naphtha continues fairly steady, especially as regards home consumption; but there is not much business to report. In carbolic, consumers are still depressing the price of crude, and now speak of 1s. 9d. to 1s. 9½d. for forward delivery. It is reported that business has been done all over next year; but the price has not transpired. Crystals remain very quiet; and there is an absence of demand. Creosote continues firm,

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and the demand from the North is very good. In some instances, makers have advanced their price to 1½d. per gallon; but consumers will not at present pay more than 1⅜d. In London, there is no actual business to report; but the demand continues very good.

The average values during the week were: Tar, 17s. to 21s. 6d. Pitch, London, 30s.; east coast, 29s.; west coast, 26s. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. Crude naphtha, 2⅝d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1½d. to 1 $\frac{9}{16}$d.; North, 1⅜d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 10½d. Refined naphthalene, £5 to £8; salts, 21s. 6d. to 22s. 6d. Anthracene, "A" quality, 1⅜d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market has been very quiet during the past week, and there has been very little business doing. Beckton still quote £11 18s. 9d.; but buyers do not seem at all anxious to purchase at this price. The South Metropolitan quotation is still £12; but at this figure there is no business doing. In Leith, sales are reported at £11 12s. 6d., and in some instances makers ask £11 15s. But there does not appear to be any large business doing for prompt shipment; and as regards forward, makers seem indifferent just at present. Business in Hull is reported at £11 11s. 3d. for prompt shipment; but, as a rule, rather more is asked for forward.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has been a better demand for house coal since last week. The supply for slack scarcely keeps up with the demand, and stocks are being reduced. A number of large contracts have been entered into with municipal authorities and millowners, and, seeing that the men at the pits are still working short time, colliery proprietors are fairly busy. Coal for shipping, however, is only a slow trade. Prospects, nevertheless, are more hopeful. While working colliers have abided by the 5 per cent. reduction, engine men and others not actually engaged below the surface in coal getting object to any lowering of wages; but whether any combined movement to resist the reduction will be brought about remains to be seen. The demand for coal for forge and steam purposes is described as "keeping up tolerably well." The increased use of oil for gas-making purposes has tended to diminish the demand for a better class of coal by gas companies and municipalities. Very large oil-tanks have been put down at the Manchester Docks by the Manchester Corporation, where oil, chiefly imported from abroad, is stored for this purpose. Quotations for coal at the Manchester Exchange are as follows: Best house coal, 13s. to 14s. per ton at the pits, seconds 11s. to 12s., common 9s. to 9s. 6d. Steam and forge coals are 7s. 6d. to 7s. 9d. for common, and better qualities 8s. 3d. to 8s. 6d. Best slack is 6s. to 6s. 6d., medium 5s. to 5s. 6d., and inferior 4s. to 5s.

Northern Coal Trade.

There is a dullness in some of the branches of the coal trade that has its influence more on prices than on the immediate demand, for the output seems at the present time to be fully taken up, though with one or two collieries the trade appears barely sufficient to keep them at work the normal period. In the steam coal trade, the tendency is steady, and the Baltic shipments continue brisk; the quantities daily sent to ports such as Hamburg being 3000 tons from Newcastle alone. Best Northumbrian steam coals are 10s. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam small are from 3s. 9d. to 4s. 3d. In the gas coal trade, there is an increasing demand on the long contracts; but the quantities that are taken are limited to those that are sent out in the winter, though each week will enlarge the use of gas coals. Prices are, according to quality, from about 7s. 10½d. to 8s. 3d. per ton f.o.b. for Durham gas coals. The contracts vary a little in price according to the period of delivery, but generally are within the figures named. Coke is steady; and though the output of gas coke is slowly increasing, the demand seems to take it up. Export prices for good gas coke vary from 13s. to 13s. 3d. per ton f.o.b.

Scotch Coal Trade.

There is a slight improvement in the demand for coal for shipment; but prices are not quotably higher. These are: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 7s. 9d. to 9s. 3d., and splint 8s. 3d. to 8s. 9d. The shipments for the week amounted to 254,865 tons—an increase of 40,590 tons upon the preceding week, but a decrease of 4934 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,607,095 tons—an increase of 154,390 tons upon the same period of 1903.

Manchester Water Running Short.—At the meeting of the Manchester City Council on the 3rd inst., Sir Bosdin Leech, the Deputy-Chairman of the Water Committee, deemed it necessary to appeal to the public to avoid wasting water. Since then the position has become more serious, and a strong hint has been given that unless a fair quantity of rain falls within the next week or so, it will be necessary to cut off the supply for several hours each day. The average daily consumption is 36 million gallons; but on two days last week it rose to 38 millions. The stock has been reduced to 1920 millions, which is equal to about 50 days' supply. It is not considered desirable to let the stock fall below 40 days' supply. The Committee on Thursday gave instructions for the issuing of a circular requesting the discontinuance for the present of the watering of streets in the city and in the neighbouring districts which share in the water supply.

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The Belfast Corporation and the Earl's Court Exhibition.—At the last meeting of the Gas and Electric Committee of the Belfast Town Council, the Gas Engineer and Manager (Mr. James Stelfox) laid before them a circular-letter with reference to the International Gas Exhibition to be held at Earl's Court in the coming autumn, and appealing to the proprietors of gas undertakings for contributions to a fund to cover the expenses. The Committee were advised that they had no power to make any such contribution.

The Locus Standi of Associations.—Among a number of changes made in the Standing Orders last week, the following was substituted for Order No. 133A, bearing upon the *locus standi* of Associations, &c. : "Where any society or association sufficiently representing a trade, business, or interest in any district to which any Bill relates, petition against the Bill, alleging that such trade, business, or interest will be injuriously affected by the provisions contained therein, it shall be competent to the Referees on Private Bills, if they think fit, to admit the petitioners to be heard on such allegations against the Bill, or any part thereof."

Proposed Extension of the Truro Water-Works.—A scheme of considerable extension is proposed to be carried out by the Truro Water Company. It is intended to construct new filter-beds, a clean-water tank, and an extra service reservoir, to cover the old one, put in a new rising main, and erect a new engine. Mr. A. C. P. Willyams, the Chairman of the Company, in explaining the scheme at the recent half-yearly meeting of shareholders, said the cost would be about £11,000 or £12,000, and would give them works capable of delivering 300,000 gallons of water per day. Power would be sought to borrow money for the extensions.

Beverley Corporation Gas Supply.—At the last monthly meeting of the Beverley Town Conncil, Mr. L. Nutchey submitted the minutes of the Gas Committee, and referred to the balance-sheet of the gas undertaking for the year ending the 25th of March last. This was, he pointed out, eminently satisfactory, and highly gratifying as regarded the work of their Manager (Mr. F. W. Oldfield), seeing that it was the first year he had been with them. There was a balance of £4157 against £2469. Thus in a year their Manager had increased the balance by £1688. He moved that the Council should grant Mr. Oldfield a gratuity of £25 in view of his past year's special services. The proposition was carried with only one dissentient.

The Thirlmere Water Scheme.—It is expected that the contract for laying the second line of pipes from Thirlmere to Manchester will be completed within the next few weeks, and then 24 million gallons of water per day will come along the aqueduct, which is about 96 miles long. Of this distance, about 14 miles are tunnels, 37 miles are "cut and cover," and 45 miles are pipes from 40 to 44 inches in diameter. The work from 1885 to 1894 cost £2,500,000, including the lake watershed and way-leaves. The second part of the scheme has taken 2½ years to carry out, and has cost about £600,000. It is intended to spend an aggregate of between £4,000,000 and £5,000,000 in bringing three more lines of pipes to Manchester, which will then have a supply of about 60 million gallons per day.

Complaints of Smells from the Reading Gas-Works.—In accordance with a resolution of the Sanitary Committee of the Reading Corporation, the attention of the Reading Gas Company was recently called to offensive smells said to arise from their works; and they were requested to take steps to prevent a recurrence of them. In reply, Mr. Douglas Helps, the Company's Engineer and Manager, stated that the only cause he could conceive as likely to give any foundation for the complaints might arise at the time of changing the lime purifiers. Seeing how unanimously the Board of Trade Committee had reported against the use of lime for purification, the Directors trusted the Town Council (who, under statutory regulations, possess the power) would no longer require the Company to use lime, and would allow the use of oxide of iron, which did not cause any nuisance. If this restriction were removed, Mr. Helps said he was of opinion that no further complaints would be received. He was not aware of a single gas-works owned by a municipality where the amount of sulphur in the gas was restricted as was the case in Reading. The letter was referred to the Medical Officer of Health, who pointed out that no result could follow upon the report alluded to without further legislation; and therefore he thought it would be wise to await the course of events before making any radical change in the purification of the gas. It was resolved that, in the circumstances, the Committee did not see their way to varying the requirements of the Company's Act of 1862 in relation to the amount of ammonia or sulphur allowed in the gas produced at their works.

The Misterton and West Stockwith Gas Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for extensions to the carbonizing plant.

At the last meeting of the Harrogate Town Council, they awarded, on the recommendation of the Finance Committee, a sum of £200 to Mr. E. W. Dixon, the Water-Works Engineer, for extra services rendered by him in connection with the Water Bills in Parliament.

The Yorktown and Blackwater Gas Company recently wrote to the Camberley Urban District Council declining to reduce the charge for lighting the public lamps to £2 3s. per lamp per annum, and reminding the Council that they enjoyed the reduction in the price of gas two years before the private consumers. The Company, however, offered to reduce the charge for the ordinary street-lamps to £2 4s. each per annum; and the offer has been accepted.

At the meeting of the Carlisle Town Council last Tuesday, the salary of the Gas Manager (Mr. W. J. Smith) was increased by £100 per annum. The matter came before the Council on the recommendation of the Gas Committee, to which an amendment was proposed to make the advance £50 only. It was, however, defeated by 21 votes to 10. Mr. Smith, who had been assistant to his father at the Bolton Gas-Works, obtained his appointment early in 1902.

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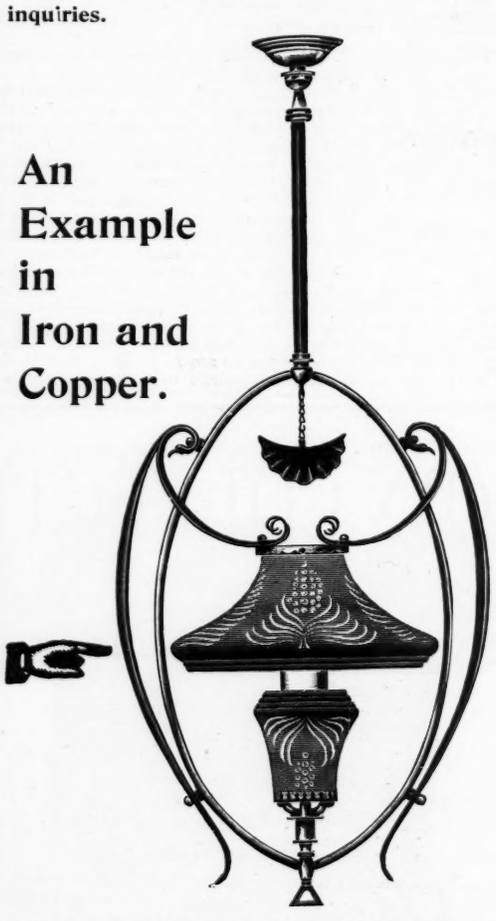

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Lighting of Palace Yard.—In the House of Commons last Friday, Sir Henry Fowler asked Lord Balcarres, as representing the First Commissioner of Works, whether, during the recess, he would complete the lighting of Palace Yard with incandescent gas-lamps, and also the Speaker's Court. His Lordship replied that the lighting of Old Palace Yard would receive consideration in connection with next year's estimates. With regard to New Palace Yard and the Speaker's Court, he pointed out that great improvement had been made, and said there did not seem to be a necessity for much greater illumination. He promised, however, that this matter should be further looked into.

Warrington Corporation Gas Supply.—The Gas Engineer and Manager of the Warrington Corporation (Mr. W. S. Haddock) in the course of his sixteenth annual report says: "The net profit of more than £10,000 is the largest realized, and equal to over 6d. per 1000 cubic feet on the gas sold. The value of tar products has fallen considerably, and is now very weak. The sulphate of ammonia and coke prices are satisfactory; and we may look forward to a good return from them during the coming year. The price of coals for the new year will be more favourable than last year. The reduction of 3d. per 1000 cubic feet made on gas sold out of the borough will lead to further consumption, and ultimately increase our profits. A concession of 4d. per 1000 cubic feet to gas-engine consumers running their engines six hours daily places gas in the foremost position for the economical production of power. The consumers by slot meter will receive an increase of 3 cubic feet per 1d., or equal to about 4d. per 1000 cubic feet, provided the consumption is not less than 6000 cubic feet per annum. The concessions made above will reduce our income about £1500, which we expect to recover through a more extended use of gas. The increased make is 16,801,000 cubic feet, or 4·5 per cent. upon last year's production."

APPLICATIONS FOR LETTERS PATENT.

16,854.—Cox, G. J., "Atmospheric burners." Aug. 2.
16,868.—Pegden, H. F., "Lamp for generating and burning oil gas." Aug. 2.
16,869.—Affleck, C., "Improving the yield of hydrocarbons from carbonaceous matter." Aug. 2.
16,874.—Wright, T. G., "Four-cycle internal combustion engines." Aug. 2.
16,895.—Bloxam, A. G., "Gas-producers." A communication from W. H. Bradley. Aug. 2.
16,900.—Wilson, G., "Prepayment meters." Aug. 2.
16,964.—Hill, G., "Lighting and extinguishing gas by the application of electricity." Aug. 3.
17,027.—Stern, H., "Liquid meters." Aug. 3.
17,047.—Lanchester, F. W., "Internal combustion engines." Aug. 4.
17,052.—Dempster, R., and Sons, Ltd., and Broadhead, J. W., "Bucket conveyors and elevators," Aug. 4.
17,055.—Dickson, J. H., "Dry meters." Aug. 4.
17,100.—Collins, J., "Regulating the supply of gas to inverted and other incandescent burners." Aug. 4.
17,127.—Maaske, W., and Kwilecki, O., "Inverted mantle lamps." Aug. 4.
17,165.—Wood, E., "Incandescent burners." Aug. 5.
17,168.—Hogan, G. L., and Tandy, L. D., "Illumination and heating by carburetted air or gases." Aug. 5.
17,181.—Testor, J. F., "Electrically lighting and extinguishing gas." Aug. 5.
17,215.—Helps, W. D., and Greenwood, J. M., "Gas-fittings." Aug. 6.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

Collector. Vickers, London. Applications by August 31.

Situations Wanted.

Foreman. No. 4256.

Plant, &c., Wanted.

Station Governor. Carnforth Gas Company.
Exhauster. Chambers. Henley-on-Thames.

Plant, &c., for Sale.

Engine, Exhauster, and Pumps. Richard Smith's Executors, Glasgow.
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Station Governor and Exhauster. Henley-on-Thames Gas Company.
Sulphate of Ammonia Plant. Alloa Gas Department.

Company, &c., Meetings.

Brighton and Hove Gas Company. London Offices, September 2, at Two o'clock.

Stocks and Shares.

Leatherhead Gas and Lighting Company August 24.

TENDERS FOR

Meters.

Glasgow Gas Department. Tenders by August 23.

Station Governor.

Carnforth Gas Company. (New or Secondhand.)

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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CHEMISTRY FOR ENGINEERS AND MANUFACTURERS. Vol. II. — By Blount and Bloxam. *Price, 16s.*
GAS, OIL, AND AIR ENGINES.—By (the late) Bryan Donkin. *Price 25s.*
METHODS OF GAS ANALYSIS.—By Dr. Walther Hempel. Translated from the third German edition and considerably enlarged by L. M. Dennis. *Price 10s.*
THE SCIENCE AND PRACTICE OF LIGHTING AS APPLIED TO STREETS, OPEN SPACES, AND INTERIORS.—By W. H. Y. Webber. *Price 3s. 6d.*
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Address, endorsed "Tender for Governor," to the Carnforth Gas Company, Limited, Carnforth.
JAMES LEE,
Manager and Secretary.
Gas Office, Carnforth,
Aug. 8, 1904

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Forms of Tender may be obtained on application to Mr. Alexander Wilson, the Manager, at his Office, 45, John Street, Glasgow, and sealed Offers, marked "Gas Department, Tender for Gas-Meters," addressed to the Subscriber, will be received by him on or before Tuesday, the 23rd curt.
The Corporation do not bind themselves to accept the lowest or any Offer.
JAMES G. MONRO,
Town Clerk.
City Chambers, Glasgow,
Aug. 1, 1904.

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NOTICE is Hereby Given of Sale by TENDER of 350 SHARES of £10 each, being a portion of the Additional Share Capital authorized to be raised in pursuance of the powers of the Leatherhead Gas Act, 1901.
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By order,
JOHN YOUNG,
Secretary.
North Street, Leatherhead,
Aug. 10, 1904.

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MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
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The TRANSFER BOOKS of the Company WILL BE CLOSED from the 20th of August to the 2nd of September, both days inclusive.
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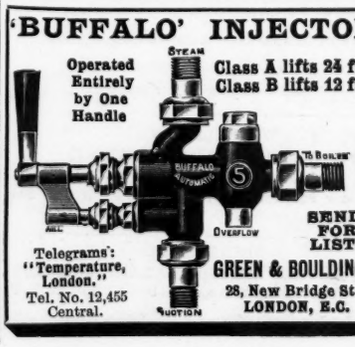

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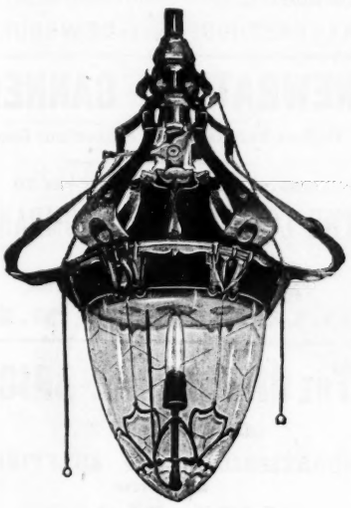

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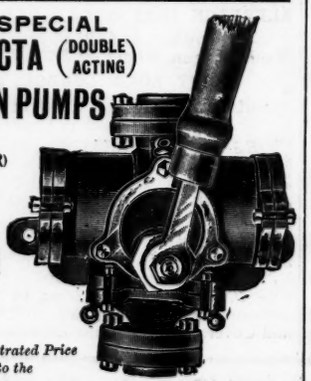

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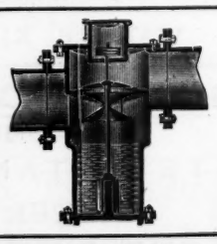

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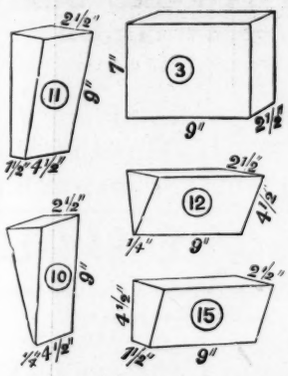

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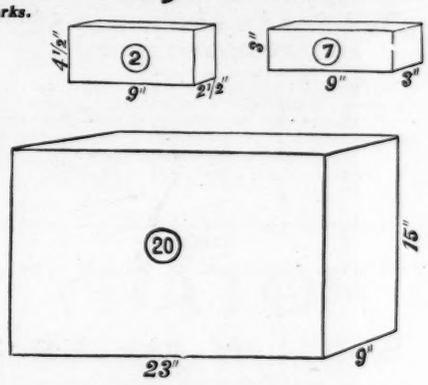

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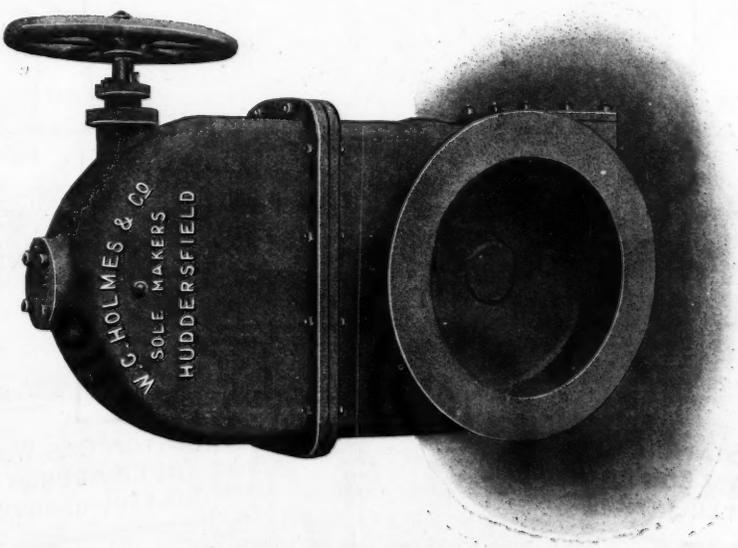

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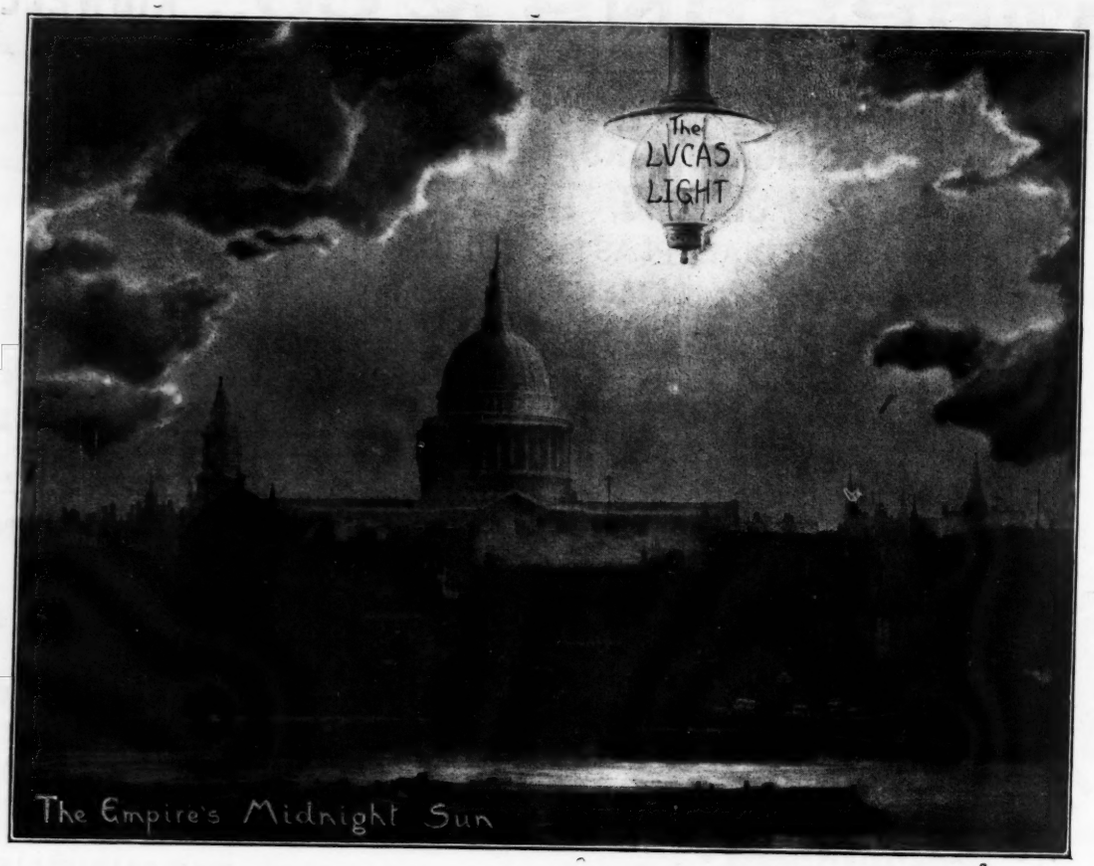

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3 gallons Tar and 20 lbs. Coke produce 1000 cubic feet 10 to 12 Candle Power Gas of the following composition—

Hydrogen	64·4 per cent.
Methane	12·0 „ „
Unsaturated Hydrocarbons	3·0 „ „
Carbon Monoxide	15·0 „ „
Nitrogen and Carbon Dioxide	5·6 „ „
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Calorific Value	400 B.T.U.

See **Prof. VIVIAN B. LEWES'S** Lecture before Society of Arts, reported in the "JOURNAL OF GAS LIGHTING," Dec. 9, 1902.

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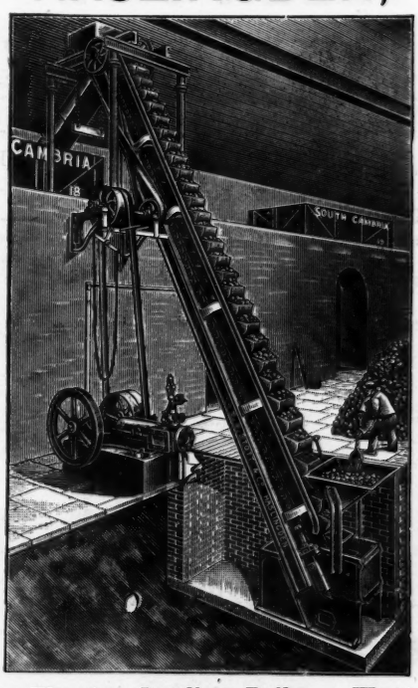

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Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.
Made in 4 Sizes consuming, 3, 4, 4½, and 6½ feet. In Brass or Nickelled.
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WELDLESS STEEL TUBING
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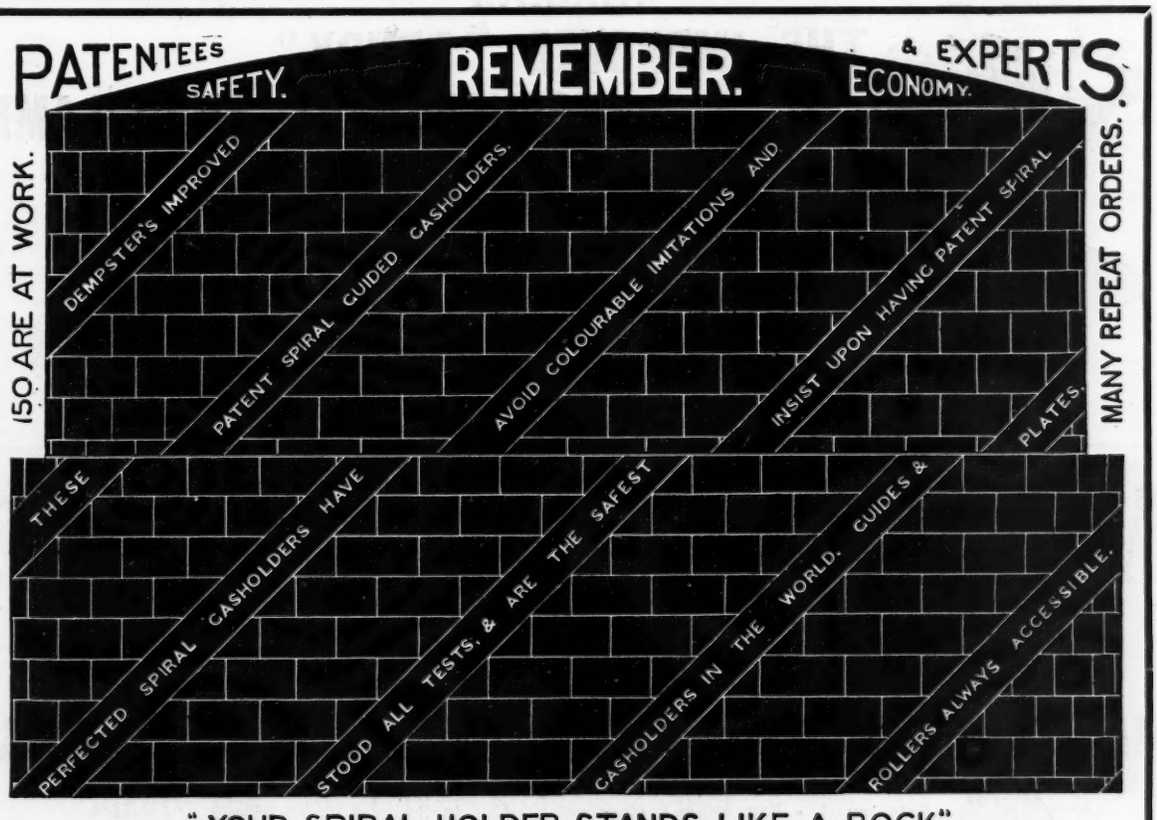

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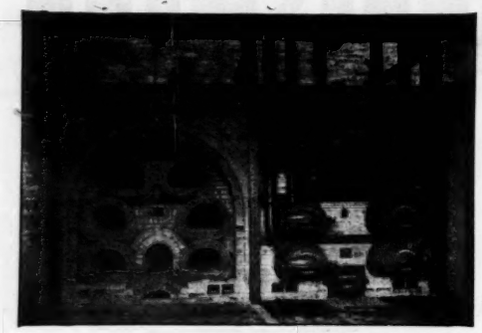

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RAIN AND WIND PROOF.

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This Lamp is artistically enamelled in fawn colour, and relieved with gold and white lines. It is made with a new method of lowering the globe, which gives easy access to the burners, and is fitted at bottom with a glass bowl and hinged and self-locking ring. It is also fitted with taps to turn off the gas, if required, and is suitable for the ordinary "C" pattern (with or without bye-pass, and lever and chains) or "Kern" Burners.

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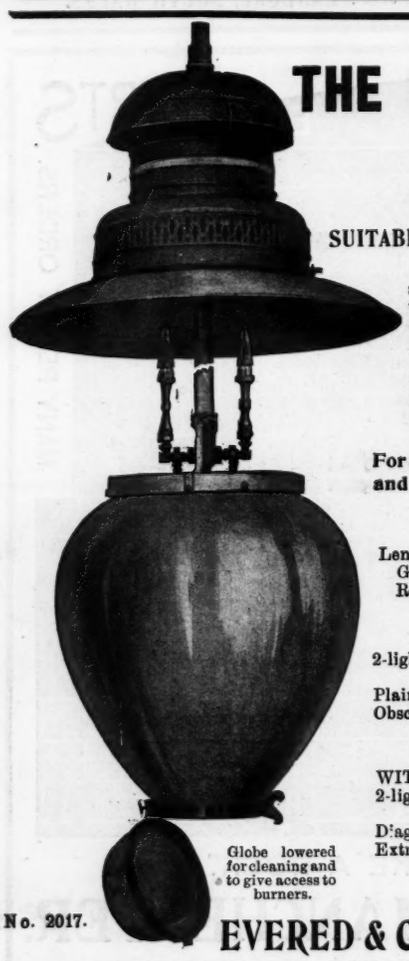

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Length over all—2 or 3 light .. 30 in
Globes .. .. 15 in. diameter.
Reflector .. .. 20 in. ,,

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WITH CLEAR GLOBE.

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EXTRA GLOBES.	EACH.
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Burners extra.

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WITH DIAGONAL OPAL & FLINT GLOBE.

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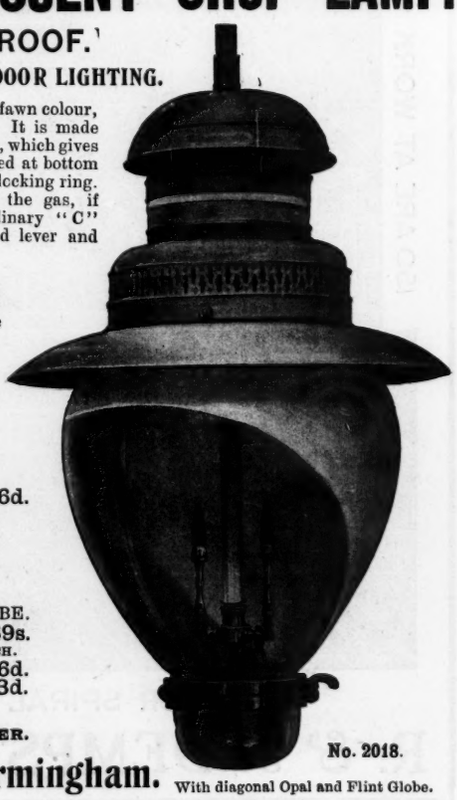
Diagonal Opal & Flint—2 or 3 light	22s. 6d.
Extra bottom Bowls—Clear ..	1s. 3d.

Burners Extra.

GLOBES LETTERED TO ORDER.



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